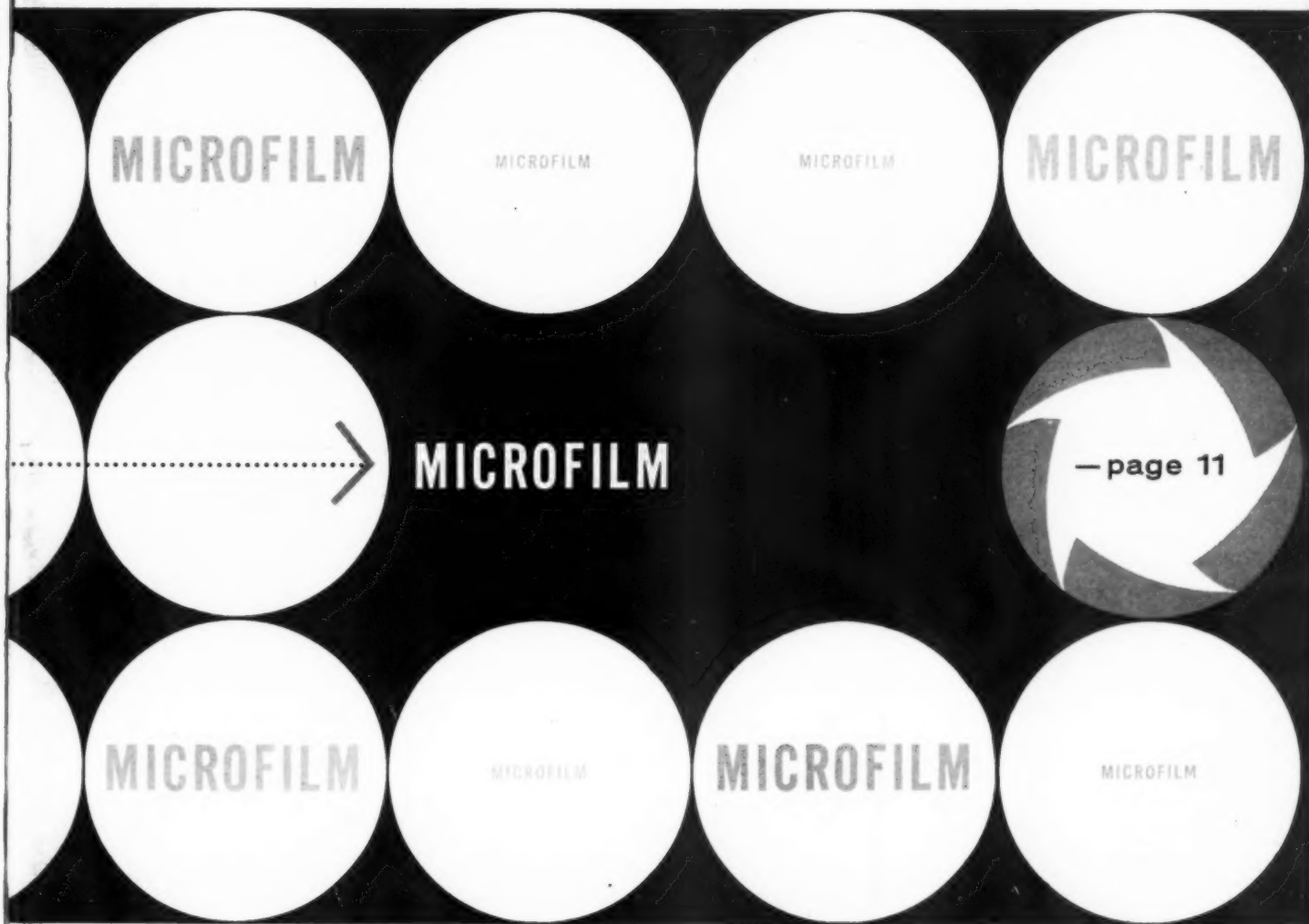
DECEMBER 1960

DATA PROCESSING®

THE MAGAZINE OF AUTOMATIC OFFICE METHODS AND MANAGEMENT



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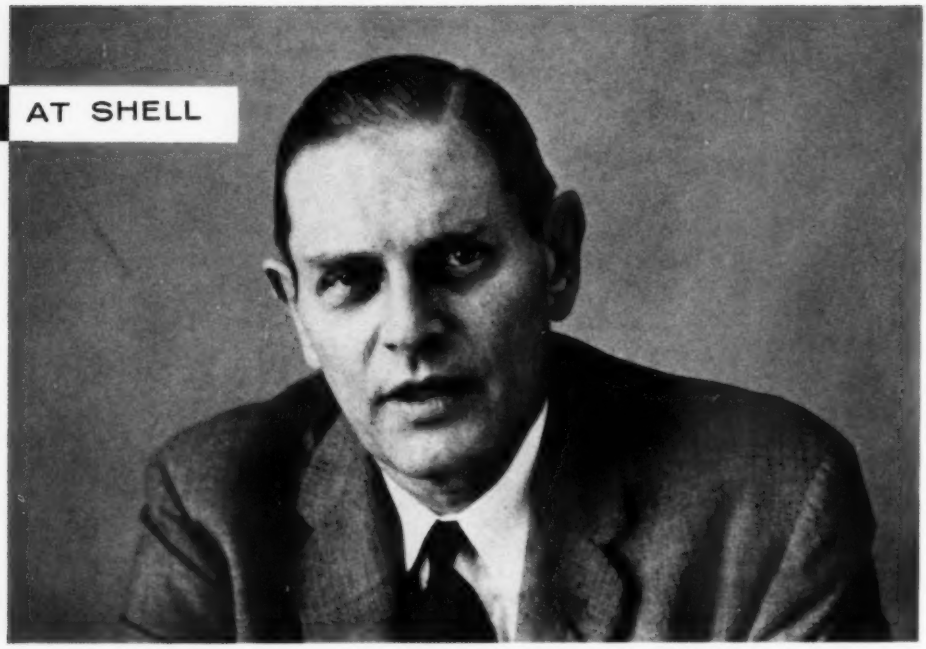
CONTROL AT SHELL



J. W. Haslett, Methods and Procedures Manager, Shell Oil Company

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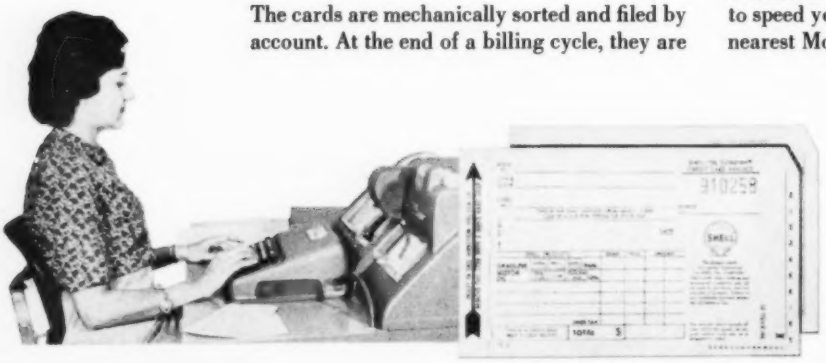
The Moore representative worked closely with Shell in developing the forms that make this ADP (Automated Data Processing) system work. For more details on what Moore can do to speed your paperwork, get in touch with the nearest Moore office. No obligation, of course.



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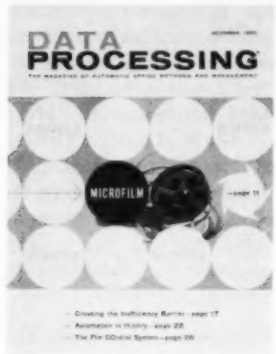

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OBSERVATIONS . . .

from the publisher . . .

—Meet the Editorial Staff

Each month the column adjacent to this one lists the persons who are responsible for the creation and organization of material appearing in this publication. It is the efforts of these people that have made possible the fine acceptance DATA PROCESSING has achieved in the two years of its existence. We are highly pleased and proud to have the opportunity of working with these people and wish to take this opportunity to acquaint you with their backgrounds in the hope of further personalizing our contact with you. Each member of the staff, while having a broad knowledge of data processing, further offers specialized abilities which cumulatively give the balance necessary to publish authoritative material in depth.

The Editor — Alan Meacham is a data processing "pro" of the first order. His thirty years of experience with punched card and electronic data processing systems has been highly diversified. An alumnus of the University of Michigan, he was later in charge of that University's department of punched card accounting for nearly twenty years and also taught in its school of business administration and department of public administration. He also served as consultant and methods analyst in punched card procedures for the University to industry and the Federal Government. Mr. Meacham has been a field engineer for IBM and has held various executive positions with Remington Rand Univac.

Managing Editor — Mrs. Goodman came to DATA PROCESSING after three years as a staff writer for *Computing News*. This experience has served her well in interpreting business computer applications for our readers. She has been a most prolific author of articles on data processing systems and is well known for her contributions in this area. Edith has an exceptional combination of astute technical knowledge coupled with a noteworthy journalistic background that is rarely found in the business press. She has served as a newspaper writer and has had material published in many outstanding national consumer magazines and several international publications. She holds a BA degree and certificate in journalism from the University of Michigan and a certificate in education from Wayne State University. She is also a member of Theta Sigma Phi, National Honorary Journalism Society.

Associate Editor — John DeJong has previously handled significant projects for industry and the government at Wayne State University Computation Laboratory. He has taught classes in data processing for the division of adult education of state universities. John is a member of the Computer Programmers Association and the Industrial Mathematics Society. He is Vice President of Computer Data Processing and Jordon Greene Management Consultants.

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AUTHORS

HENRY M. BOETTINGER *(The Place of Automation in History)* began his Bell System career in 1948 with the Chesapeake and Potomac Telephone Company of Maryland. He held the position of General Financial Supervisor and Stock Transfer Manager with American Telephone and Telegraph Company at the time of his transfer to Michigan Bell as Vice President and Comptroller in April, 1959.

Graduated from Johns Hopkins University with a degree in engineering, he also attended the University of Michigan and New York University's Graduate School. Mr. Boettinger is a member of the Controllers Institute of America, the Board of the International Institute of Metropolitan Detroit, the Alumni Board of Governors of New York University, and The Johns Hopkins Club.

ARTHUR D. EVEN *(Microfilm)* has pioneered in the use of microfilm in engineering systems. He is an engineering graduate of both Purdue and Wayne State Universities, having a BSME from the former and an MSIE from the latter. Currently he is working toward his Ph.D. in communications at Wayne. This study has included work in closed circuit television data transmission using microfilms of engineering drawings.

He is well known in industry and government where he has held engineering and management positions and served on numerous Department of Defense projects. Today he is recognized as one of the country's leading authorities on the use of microfilm in high-volume engineering systems. In 1958 he received the Department of the Army Commendation for Meritorious Civilian Service for his design of the basic Army Ordnance integrated engineering data processing system.

CHARLES N. MOORE *(Teaching without Hardware)* is assistant professor of Business Statistics at the University of Alabama. He received his B. S. degree from Auburn University, then spent five years during

World War II as line officer aboard various amphibious craft for the Navy. He earned his Master of Business Administration degree in accounting at the University of Alabama in 1948. Professor Moore was research associate for the Bureau of Business Research at the University of Michigan from 1951 to 1953, and received a Research Award from Air University to study Air Force use of electronic computers in 1955-56.

DR. DAVID R. WOLF *(Crossing the Inefficiency Barrier)*, after completion of graduate work in organic fluorine chemistry at the University of Colorado in 1954, joined the research department of the M. W. Kellogg Company. There he was involved in the development and application of fluorocarbon elastomers, becoming responsible for customer service for these products.

In 1957, Dr. Wolf was employed by Minnesota Mining and Manufacturing Co. and became associated with the development and commercial application of Microfilm Products of their Duplicating Products Division. He is presently Applications Research Supervisor, Microfilm Products. ■

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Comments

NMAA Interest

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I arrived recently in Trinidad from the U.K. to take up a new appointment and came across a copy of DATA PROCESSING. I was impressed with it and have requested a subscription. . . . Congratulations on your fine magazine.

Reference was made in DATA PROCESSING to the "Machine Accountant's Journal" and to the "National Machine Accountants Association." Could you in any way assist me in finding out more about the journal and the association. . . .

P. R. Hall
Data Processing Supervisor
Shell Trinidad Limited

A number of requests have been received for further information about the NMAA. For others who may be interested in obtaining details about the association, the address is: R. Calvin Elliott, Executive Director, International Headquarters, NMAA, 1750 W. Central Rd., Mount Prospect, Illinois. Editor.

Data Processing for Hospitals and Clinics

Vicksburg, Miss.

Dear Sirs:

We note with much interest the article in the October 1960 issue of DATA PROCESSING entitled "Hospital Automation Center" on page 46.

Our service center is presently serving hospitals and clinics, and is in the process of designing a standard system to make available to more smaller clinics and hospitals the advantages of automated data processing. . . .

Our center has an 047 Tape-to-Card Converter. However, we are also in a position to accept code sheets for key punching from businesses that do not have the equipment to perforate tape.

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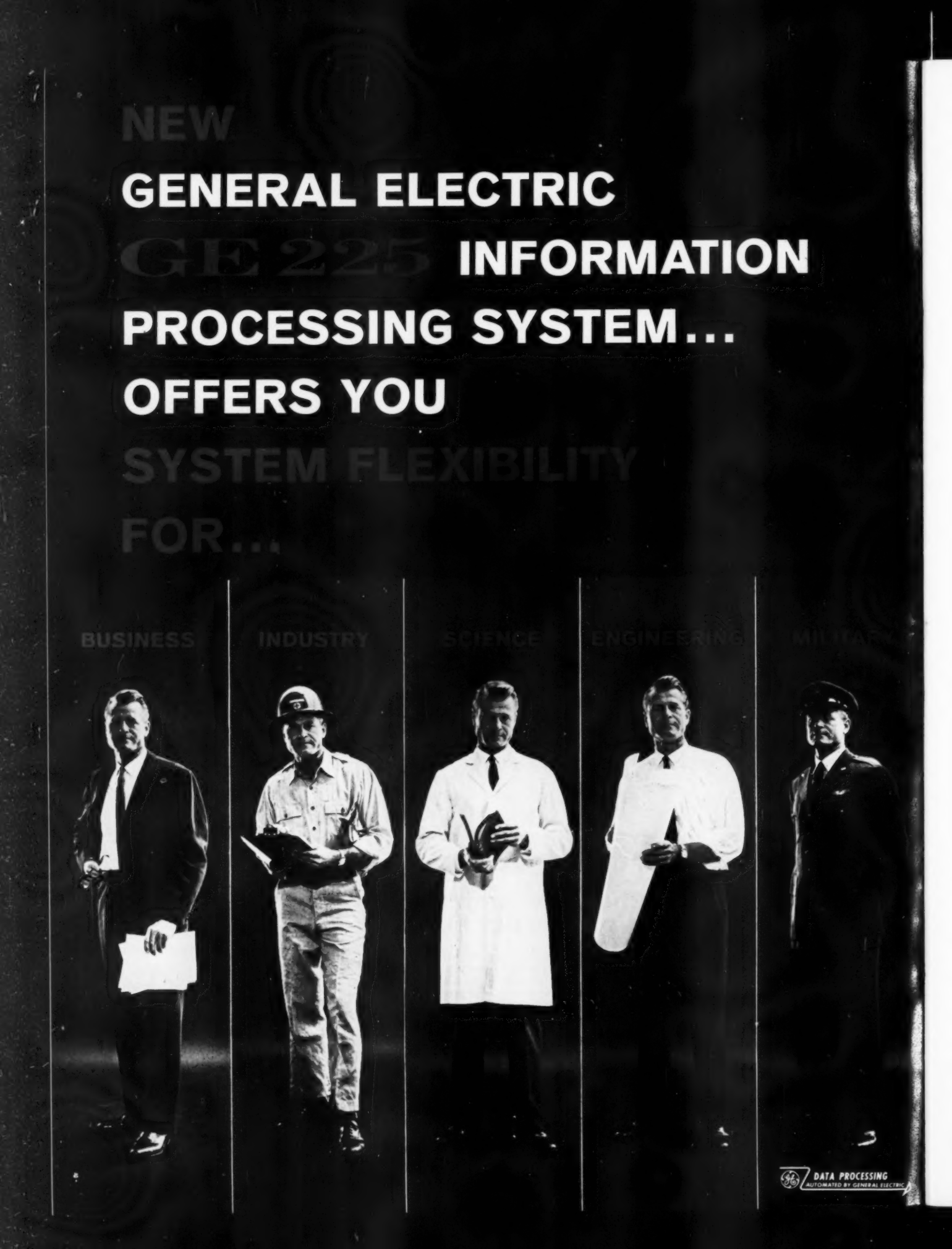
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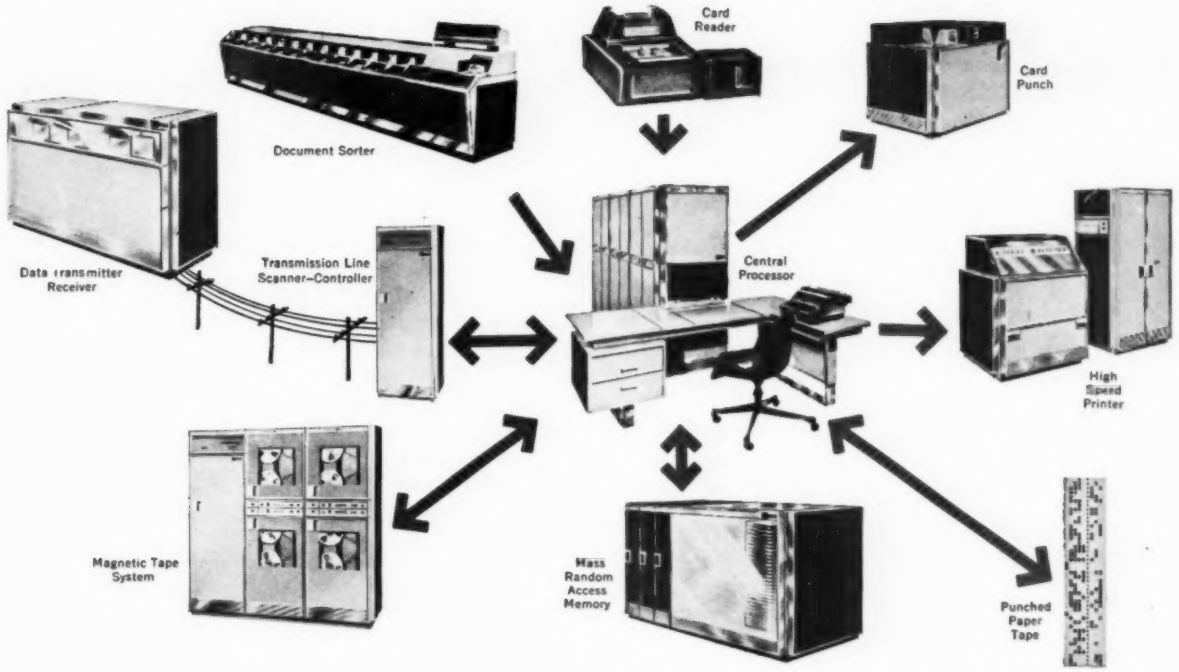

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NEWS SUMMARY

GENERAL

IBM's report for the nine months ending September 30 shows net earnings amounted to $119,088,057 after taxes. This puts this year's earnings at $6.51 a share as compared to $5.57 a share for the same nine month period last year.

National Cash Register set a new record for the third quarter of 1960 with a six per cent increase over the same period last year. The net income totalled $4,591,504; the sales for the first nine months totalled $315,768,220.

Microfilm/computer/ research

The *University of California* has leased a Stromberg-Carlson High-Speed Microfilm Printer/Plotter. This printer is designed for use with high speed digital computers and will be used for research. It can record output data on microfilm at the rate of 15,000 characters or 12,000 plotting points per second. It can be used for graph plotting, tabular printing, design engineering, and computer monitoring.

Laboratory for Electronics, Inc., opened the Monterey Laboratory for operations analysis and computer programming for all LFE systems work covering airborne navigation, air traffic control, ground support equipment, and data processing.

Minneapolis-Honeywell changed the name of its Datamatic Division to the Electronic Data Processing Division.

NEW APPLICATIONS

Mail order accounts

Speigel, Inc., one of the nation's largest mail order houses, has acquired an IBM 7070 system to control over a million *customer accounts*.

The investment house of Paine, Webber, Jackson & Curtis has purchased IBM's 7070, and two 1401s, to handle more than 100,000 accounts which produce an average of 3,000 *trades* daily.

The Continental Assurance company has acquired an IBM 705 to handle 400,000 *policies* which formerly involved using two million punched cards.

Larc for research

The Lawrence Radiation Laboratory of the University of California, operated for the U. S. Atomic Energy Commission, has accepted a Univac Larc. This computer system, claimed to be the fastest and most advanced in operation anywhere, will be used in a variety of AEC supported *research projects* to solve problems of great complexity, which could not be handled on other existing systems.

Data transmission

American Telephone and Telegraph Company plans to put the first station of a *satellite relay system* into space within a year. The station would provide for experimental transmission of telephone calls, television, data transmission and other types of communication between the United States, the United Kingdom and continental Europe. The proposed spheres would be four feet in diameter and weigh about 175 pounds.

FOREIGN

Commercial computing

The first independent commercial computing center in Britain will be operated by the British subsidiary of C-E-I-R. The London Research Center will be equipped with an IBM 7090 and an IBM 1401 data processing system, for use by government and commercial clients both in Britain and western Europe.

Japan Air Lines has a Bendix G-15 computer for *planning jet plane routes*, lowering operating costs, and boosting efficiency. JAL is the only airline of the 13 serving Tokyo which has an electronic computer. ■

$$Re = \frac{20500}{D} \qquad F = 0.1\left[\frac{K_1}{\text{Log } Re} - k_2\right] \qquad \Delta P = \frac{0.135 f L Q^2}{D^5}$$

The equations:

ALGOL language:

```
RE=2050Q/D;      F=0.1(KI/LOG(RE)-K2);
DP=0.135*F*L*Q*2/D*5
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Other features of the Burroughs Algebraic Compiler: one-pass operation; semi-automatic segmentation; powerful indexing ability; comprehensive means for communicating with external equipment and with sub-programs, including independent, self-contained procedures; and extensive switching, decision-making and editing facilities.

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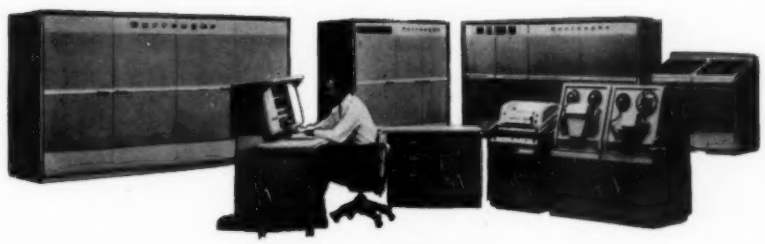

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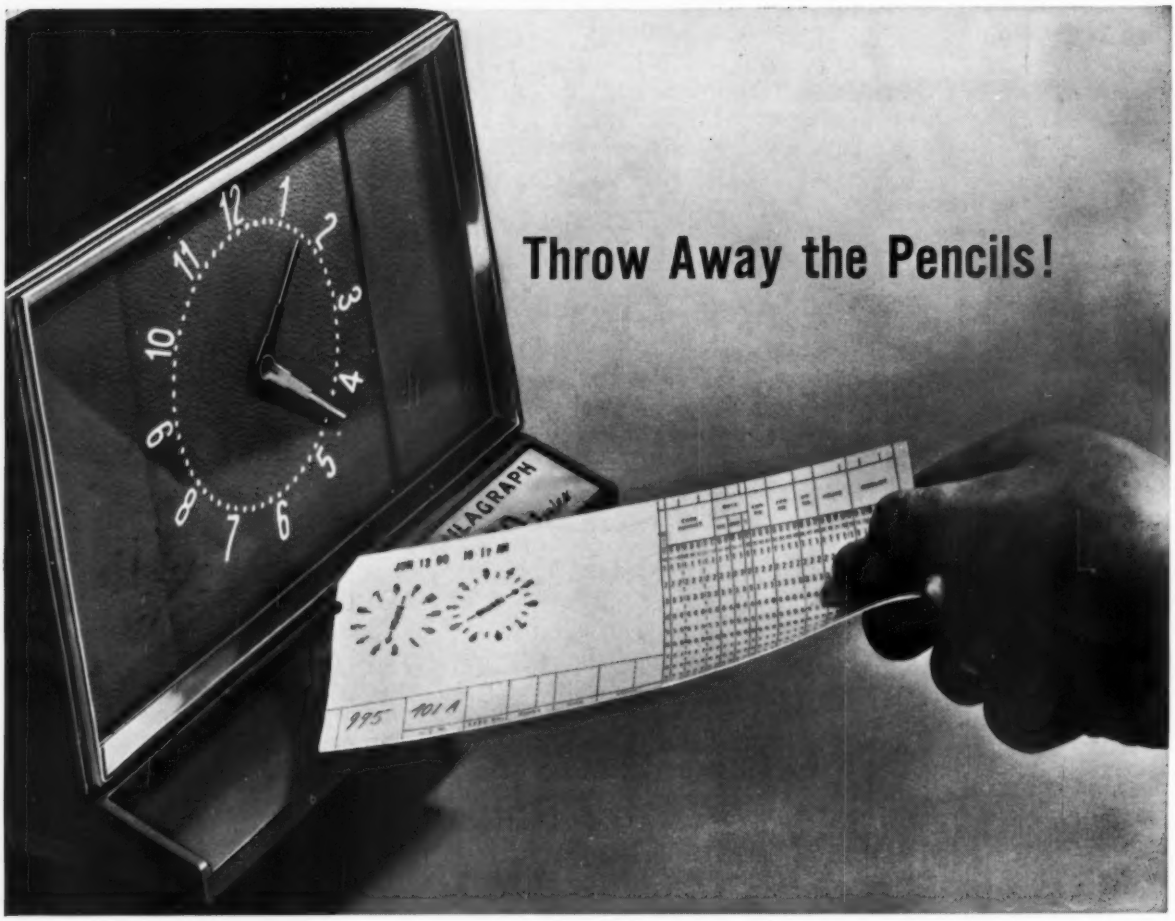

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COVER FEATURE

MICROFILM

New tool for data processing

By Arthur D. Even

FOR YEARS microfilm was considered mainly as a safety factor in the storage of old record material. It also found additional protective use by allowing the decentralizing of copies of vital documents against the hazards of fire, theft, and other losses. For certain applications, microfilm offered an economical means of retrieving stored information, but its role primarily was one of economical insurance.

The use of microfilm introduced a whole range of new problems. The organizing of documents for microfilming was time consuming. Sometimes the source document was of poor legibility and the finished film unsatisfactory. Indexing was often a major problem, especially when additions or changes were still being made in document sets. The use of microfilm introduced new equipment for taking pictures for film processing, for viewing at [illegible] adequate for comfortable reading by the human eye, and for enlarging back to full size. This equipment was costly and often tended to fill some of the space that microfilming was supposed to save. Equipment and materials were barely adequate for documentary microfilming.

The use of microfilm disclosed a severe weakness inherent in the medium — the possibility of destroying, or even changing, information due to scratching. In addition, even the best enlargements were blurred and fuzzy and a poor substitute for the original document. In many cases there was a resistance on the part of the user to having to examine indexes and to handle a large number of microfilm rolls in the search for widely scattered information. The substitution of an ever-expanding volume of microfilm rolls was not looked on as a panacea for solving the data custodial problems of all organizations.

In spite of the apparent limitations of microfilm, there were those with vision who could foresee microfilm not as a dormant element of overhead, but as a potential tool in the organization's data processing and record keeping network. Widespread interest in microfilm today is a tribute to those people who solved many of the problems previously mentioned and to others who pioneered in the use of microfilm as a tool of system design. Now let us look at what has been done, noting where microfilm stands today. Then let us note some of the areas in the organization which might be examined for practical applications of microfilm.

Microfilm defined

Before getting into this technology, it might clarify things to define the subject. *Microfilm*

consists of nominally clear-base material coated with light-sensitive ingredients which accept and hold a visible, permanent, reproducible image when processed through a combination of light and chemicals, vapor, or heat. This is a broader definition than is associated with general photography. There, one is concerned with silver halide film (usually not of as *fine* quality), the use of the light for exposing, and a chemical process for bringing the latent image into visible and permanent form. In the case of microfilm, however, the definition must provide for copying films of other than the silver halide type. These depend upon ammonia vapors or heat for bringing out the image, depending upon the type of film used. Our definition is somewhat broader than might be accepted by some *in the trade* who claim that the term should apply only to certain sizes of film. Yet these fine technical points appear not too relevant to our main discussion.

Specifications and standards

From time to time references will be made to engineering drawings. In so doing it is not meant to give the impression that we are talking of an engineering system or that microfilming is primarily an engineering system tool. This is not the case. Rather, drawings are mentioned because this microfilming is of the precision type. If your microfilming quality will satisfy the needs of the engineering department, it should satisfy all of your needs. In terms of quality we might think of microfilming of drawings at one end of the continuum and high speed record type filming at the other. References also will be made to Department of Defense requirements where the specifications and standards representing these needs generally represent acceptable levels of quality. A company following these criteria will find that the same equipment can be used for making adequate microfilm both in its defense activities and of its own commercial drawings. In developing specifications and standards, the defense needs usually are coordinated with industry associations representing manufacturers of equipment and material. Therefore, the new technology of the Department of Defense today may often reflect the commercial standard of tomorrow.

The film and camera

Today microfilm — the basic raw material in the picture making process — is good. It is safe to say that the United States has the best microfilm in the world. Personal investigations a few years ago in France and Germany disclosed no camera film which could be considered *in the same league* with the best American film. This was true in part because Europe was doing relatively little microfilming compared to the United States. Present European interest in *Engineering Data Processing System Design*[1] gives an indication that this situation may be changing rapidly. In any event, good microfilming is available for use in today's data processing and record keeping systems.

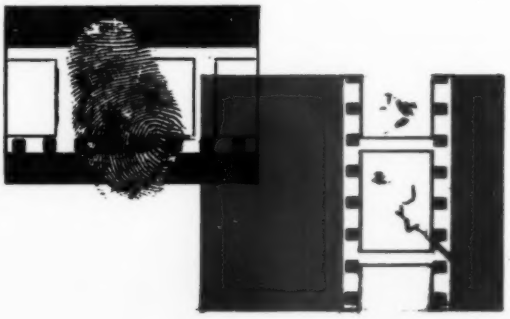
Cameras continue to be improved with more models becoming available. Some of these are imports from Germany and Japan which have been modified to suit the American market, and are usually sold under the label of the American importing organization. When microfilm is to be used as a data processing tool, more emphasis must be placed on quality; the average quality level of all cameras becomes higher each year. This trend should continue. The buyer should be cautious as there is a range of quality within a given model number. The new camera should be thoroughly calibrated and tested to assure its ability to produce consistent results within the required quality range.

Film processing and inspection

Processing of the exposed film into finished microfilm can be done by the picture taking activity or by a commercial processing organization. In making selections as to method *(i.e., do-it-yourself)* or source *(i.e., of processing equipment or service contractor)* the risks should be considered. The company is interested in guarding its investment in data which are currently in a latent image form in a roll of microfilm. If these images are destroyed because of poor processing, what does it mean? A processing company usually will replace the raw film free. This is a small part of the total investment involved. So it is evident that care should be exercised in the selection of methods or source.

Inspection of the processed microfilm assumes major importance when it is to be used as a system tool, because invariably the finished film will be used for reproduction purposes. Therefore, any faults in the film, in the picture taking, in the

[1]Arthur D. Even, ENGINEERING DATA PROCESSING SYSTEM DESIGN (*Princeton, N. J.: D. Van Nostrand Company, Inc., 1960*), p. 282.



processing, or in the general handling which results in poor images, scratches, finger marks, bubbles, dust and dirt, lap marks, and the like, will tend to limit the use of the film.

We have seen that with a little judicious care in selecting and monitoring equipment, materials, and services, satisfactory microfilm can be obtained. But what about intended use?

Influences on film use

The use of microfilm will depend greatly on the form it is in and the form will be determined by the intended use. This is not double talk. Rather this means that for microfilm to be valuable it should have a planned place in your data processing and record keeping system. In designing the system, then, it must be decided if film is to remain in roll form or if it is to be unitized *(cut up into individual frames)*. Previous discussion indicated that film in roll form had limited use. In an attempt to correct this situation, work has been done toward adding indexing provisions to roll film to speed up data location. However, such methods have not found widespread acceptance. Film in roll form generally will be identified with a low volume system.

The unitizing of film immediately opens up many system design possibilities, so much so, in fact, that there is no unanimous agreement to approach. For example, there is available electronically manipulated film. This is film of a relatively small size having dark and transparent areas arranged to provide coded information for electronic sorting. The American version of this system operates at relatively high speed in conjunction with a digital computer. This is also a closed data system with film copies being produced while the master film remains in the system. The French version uses somewhat larger film and operates at speeds normally associated with certain models of punched card equipment. These equipment packages are still few in number and might be considered pilot models of the future.

In looking further into unitized technology, we find some film stored as individual frames or strips in envelopes and jackets, with these holders serving as protective devices to reduce film scratching. Often the film is stored, handled, viewed, and enlarged while still in the protective custody of the envelope. These and other carriers where the film is held somewhat loosely might be considered an advantage over the average roll storage, but are associated with slow-moving manual systems. This brings us to the microfilm-punched card combination which has been receiving widespread attention. Here microfilm is attached permanently to a card which may be manipulated through punched card equipment. This is carried one step further with the use of sheets of copying film of punched card size which can be manipulated through punched card equipment. When microfilm is used in punched card equipment, these machines must be modified to minimize damage to the film. In modifying the equipment, portions of certain machines are permanently deactivated. These machines must be allocated for film handling or all other cards of the organization designed so as to avoid using these columns.

Today there is only one known carrier available for permanently attached microfilm. This is a cold seal process; it is understood that there are more processes in the experimental stage. In the cold seal process, the aperture card *(with the adhesive protector removed)* is placed in a mounting machine with the film roll. A segment of film is cut and affixed to the exposed adhesive edges under the proper pressure. Manual, semi-automatic and fully automatic mounting machines are available.

Film viewing

To this point, we have noted the equipment and materials available for preparing finished microfilm for use in systems of varying degrees of sophistication. These systems call for putting microfilm to work in different ways. The first of these is viewing, where the image is enlarged to satisfy a temporary reading need. Generally, viewing is

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necessary during the inspecting and programming of the film into the system's storage as well as for output. There is quite a range of quality, type, size and price of viewing equipment. It should permit sustained operation, in normal room light, without objectional eye strain, and with little or no film scratching. Viewers are designed to accept film of a specific size and form *(i.e., roll or carrier)*, some equipment being more flexible than others. Equipment may be contained in one machine or consist of a projector and screen. Often size is determined by the need for tracing an image of the same size as the original document *(such as the making of duplicate engineering drawings)*.

Going one step further beyond the viewing of temporary images, there are viewer-printers for making *hard* copies of the enlarged image. To date the emphasis here has been on shortening the cycle time, reducing the unit cost, and improving the quality of the enlargements. Most of these copies are not permanent and are intended to satisfy a temporary need.

Volume reproduction

The volume reproduction operation requires economical materials and a final end product which can compare favorably in quality and cost with copies which are made by other methods. For example, a comparison might be made between the cost of making a full-size copy of an engineering drawing using conventional printing methods *(e.g., a blueprint)* and an enlargement made from microfilm. A few years ago enlargements were all made by the photographic process. However, these were slow and costly. As microfilm received wider acceptance as a system tool, emphasis was placed on more rapid enlarging at lower unit cost. Today photographic enlarging is done faster and cheaper than before. In addition, new processes, such as electrostatic, are being employed. Also there are other techniques in various stages of development for bringing out the latent images by vapors and by heat.

Film copies

Large systems require multiple copies of the same document. Microfilm systems are no exception. At the beginning, film copies were of the silver halide type made by contact printing and chemical processing. Today there are available copying films which are *developed* by ammonia vapors and heat. This makes it possible to produce a film copy on a unitized basis with the duplicate film being mounted in a carrier and without damage to the film or the carrier. Such copying methods introduce flexibility into system design by making possible quick and economical copies of film stored in carriers. Furthermore, unitized copying makes possible variable quantities of document copies — an essential element of a system having variable distribution.

Microfilm applications

Having acknowledged microfilm as a potential system tool which is capable of being temporarily viewed or copied in film form or as an enlargement, let us look at possible money saving applications. Here it might be clearer if related uses such as might be found in a manufacturing organization were discussed. Beginning with the engineering department, drawing and allied engineering documentation can be recorded, stored, retrieved, reproduced and transmitted in microfilm form. The use of this medium makes possible the economical distribution of the same information to several different activities within the engineering department, the company unit, or to multiple corporate divisions. In this regard the Department of Defense has recognized the microfilm aperture card as the standardized medium for handling of product type drawing data between contractors and the government and for interchange among the Federal engineering agencies. Engineering applications cover a wide range beyond the product drawing area *(e.g., standardization studies and distribution of standards information, packaging engineering, tool engineering, and the like)*.

The flow of microfilmed drawing data into production planning and control permits easier study of the product drawings and ready location of process data and other information needed in planning and controlling manufacturing. Here additional advantages can be gained through the full use of the mechanized features of the microfilm carrier. The service department, both at the company planning level and at decentralized points can benefit from microfilm. Upon the receipt of product drawing data from the engineering department, the parts can be studied, those to be stocked as service parts selected, and the potential mortality estimated. This process could be aided by the storage of previous data in microfilm form. Once that service information is determined for new items, these data can be distributed to decentralized service stations, and to customers, for reference use. The purchasing department can find many uses for microfilmed information as to sources, prices, and the like. In addition, the retaining of drawing and specification data in microfilm form can reduce the bulk of information which is frequently stored temporarily for bidder reviews.

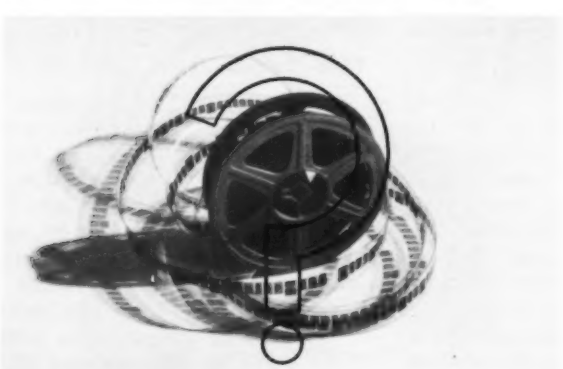
In addition to the previous applications, microfilm is being used either as a system tool or for documentary purposes involving: insurance company customer records; labor union membership records and library uses *(such as National Labor Relations Board decisions)*; public library charge-

outs; hospital case histories and patient files; personnel records *(employee job changes, wages, etc.)*; police department criminal identification records; title and abstract land records; vital statistics of the city, county, state, and Federal governments, including death, divorce, and other records; transportation routes and rates; motor vehicle license applications, driver's license and certificate of title; banking records involving checks, statements, and loans; cycle billing, including sales slips and statements from department stores, oil companies and credit houses; fire departments for location of hydrants, routes, detours, etc; highway department records of road conditions, repairs, engineering drawings and records.

The list of potential microfilm applications is long and no attempt is made to list them all here. Suffice it to say, the examples given are those which one might expect to find if the company data flow had been studied as a complete system. Although we have emphasized the microfilm, we should not forget that a picture is just a part of the data package. The carrier — whether it be hand written, typed, punched, or capable of digital computer manipulation — is also an essential element of the complete information. Once a mechanical or electronic operation can be justified for the handling of the picture and its carrier, additional benefits may be gained through expanding the use of this equipment to include broader areas than originally contemplated.

The future

It is believed that microfilm will continue to command an ever increasing respect in systems improvement projects. From the experience of successful operations will come more commercial and government applications. And with this increased volume will come better materials, processes and equipment. Microfilm seems to be destined to be with us for some years to come. It would seem that the success of the organization's system often will be judged by the manner in which this medium is employed. It is not too soon for you to investigate its impact on your future.



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De Paris on EQUIPMENT —A Regular Feature

Magnacard System and Storage Devices

JOSEPH R. DE PARIS

MAGNAVOX RESEARCH LABORATORIES reports continuing progress in the development of the Magnacard system described in this column in the July issue.

Magnacard, you may recall, is a 1″ x 3″ magnetic card with a capacity of up to 1,000 decimal characters. This *unit record* is processed by techniques and machines which are capable of performing automatically, without direct operator intervention, all the functions encountered in file maintenance. Sorting, collating, deleting items, adding items and the like are accomplished at a rate of 300 inches of cards per second, faster than any tape transport now in use.

In the July column it was declared that "if and when this new medium is applied to practical data processing situations, a new dimension in data processing will be born." It now appears that the new dimension drew its first breath of life at the Rome Air Development Center this year. Delivered earlier in the year, acceptance tests were completed in August of a general purpose card handler with an integrated automatic file and control unit.

The control unit included with the system provides for input-output, sorting, selecting, and file operation. Any of these functions are accomplished completely from remote control. Sorting and selecting can be performed on any field of the card and the complete sort operation is done automatically. Magazines are utilized in all of the card passing stations and thus manual handling of the cards is completely eliminated.

The ability of this equipment to process tens of thousands of cards at high speeds by remote control while retaining the flexibility of the unit record must inevitably excite the creative talents of systems people. This working system at the Rome Air Development Center is an important step on the road to establishing the practical worth of this new dimension.

Magnacard for data processing

Magnavox further reports that a complete data processing system based on Magnacard is now in the construction phase. This system consists of a card handling unit similar to the one described and a general-purpose stored-program digital computer. The card control unit communicates data between the card handling unit and the computer. The computer is a magnetic core machine with 4,096 words of memory. An on-line printer is part of the system.

The Magnacard data processing system is general-purpose in its scope. Present plans are to install a pilot model at Magnavox headquarters and to utilize it in the accounting department on typical business data processing applications.

All card handling functions in the data processing system are under the control of the stored program. As program commands are issued, the card control unit interprets the commands and undertakes the necessary mechanical actions in the card handling segment of the system as well as routing data to and from reading and writing heads. Timing functions are built into the card control unit; therefore, the programmer is relieved of concern with realtime actions.

Magnascriber

A significant new development will be part of this new data processing system. This is an off-line desk-top device called a Magnascriber. The Magnascriber will be used for preparing magnetic cards from transactions on source documents. This unit is the "key punch" for the system but with several real advantages over the key punch. First, the data is recorded magnetically in a manner completely compatible with recording of information in other parts of the Magnacard system. This means that the input data can be read at the full Magnacard rates and that data can be added automatically to the transaction cards. Second, the transaction cards can be used exactly as if they are generated from the high speed equipment, i.e. sorted, merged, selected, and the like. Finally, cards produced by Magnascriber are reusable indefinitely for the obvious reason that destructive holes are not punched and magnetic bits are erasable!

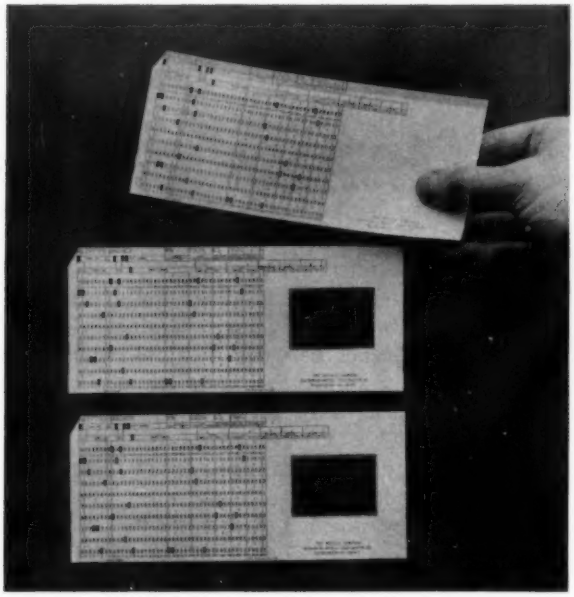
The Magnascriber development is based on a unique recording head. This head is a specially designed printed circuit that records a character at a time in digital form directly from key-actuated relays. A standard punched card keyboard is used, providing all of the codes customarily available with key punches, plus several additional codes. The writing is accomplished electro-mechanically with the writing head indexed one character at a time, somewhat in the manner of a typewriter.

Such is the Magnacard story to this time. The Magnacard system has the potential of becoming a major contribution to data processing. Whether and to what extent this potential will be realized depends, of course, on many factors. It will be interesting to follow the progress made by Magnacard as it is applied to typical data processing applications.

1405 Ramac

At long last IBM has announced a Ramac disk storage random access unit for both the 1401 and 1410 data processing systems. The new unit is the 1405 Ramac, available in two models. Model 1 stores 10 million characters in 50,000 200-character records on 25 disks. Model 2 stores 20 million characters using 50 disks. Each model comes with

(continued on page 37)



Three identical punched cards are made for each drawing from Miehle's files. The top card—containing only the information and no film — is made for use on the sorting machine. Since the card is for information only, no film is needed. The middle card becomes the master working file copy, while the bottom card is sent outside the company for maximum security.

Crossing the Inefficiency Barrier

Microfilm may solve problems created by paperwork explosions better than any other method, product or procedure.

By Dr. David R. Wolf

TODAY, MORE THAN EVER BEFORE, microfilm is being recognized by alert methods and systems people as one of the most powerful tools yet devised for the efficient handling of records and data.

Long considered a method of storing old information or duplicating files in case of disaster, it took World War II and advances brought by automation in the years since to really bring microfilm into its own.

Yet the industry is still handicapped by misconceptions and a lack of understanding on the part of many as to what microfilm can really do for modern business and industry. As a result, I'm afraid that many firms are missing out on some real possibilities for more efficient record handling, faster and more economical retrieval of data and in some cases more flexible operations through complete elimination of original paperwork files.

At the same time I emphatically believe that microfilm holds more promise for the future in terms of solving the paperwork explosion than any other single method, procedure or product on the market today.

In fact, I think I'm entirely safe in saying that paperwork in the future will be largely replaced by filmwork.

In comparing the strides made by microfilm in the past twenty years with other business tools — typewriters, dictating machines, reproduction and filing devices — I don't think there is any comparison to the spectacular development in equipment and techniques made by this mushrooming industry.

Microfilm advances

What has happened is this:

In just the past five or seven years, microfilm has emerged from behind a wall of ignorance and underdevelopment in largely passive applications to become one of the most useful and economical methods of handling active records and information.

Instead of passive applications like the recording of old business records which are shipped out to a mountain storage vault, microfilm is doing day to day jobs that surpass the dead storage and security of disaster application.

For instance, microfilm is saving taxpayers over

$53,000 each month at the U. S. Army's Rocket and Guided Missile Agency at Redstone Arsenal, Alabama, by putting the first copy of a drawing on microfilm instead of on paper for faster retrieval, reference and print-out.

At the Westinghouse Electric Corporation microfilm is now doing for $1 what used to cost $5 to do in paperwork — and in half the time.

In Chicago at the Miehle Company, giant printing press manufacturer, microfilm has saved the firm thousands of dollars in the ability to retrieve drawings that were formerly re-drawn because it took so long to find the originals.

A mail order firm is microfilming incoming order forms for the record and sending the original back to the customer as his invoice — eliminating office paperwork.

At the Signal Corps' equipment support agency at Fort Monmouth, New Jersey, it used to take 16 hours to locate, pull and refile 1,000 paper intermediates — now microfilm does the job in four hours.

Everywhere microfilm is finding new applications and use and at much less cost. Leading oil companies, Cities Service for instance, have completely eliminated original records by filming all customer credit card slips and sending the customer the original. Thus, the passive or storage application — keeping both the original and the microfilm copy for reference and protection — is eliminated.

Active microfilm

We have now crossed the inefficiency barrier and proceeded into the active application of microfilm — where it replaces the original and becomes the working copy.

Active microfilm can streamline almost any existing paperwork problem. Given the problem, I've rarely seen an application that can't be done more efficiently and at lower cost — at the same time reducing the enormous bulk problems that face us all. Only when firms have entered the microfilm world and crossed this barrier will they become modern firms and only then will they begin to benefit from impressive time and dollar savings. Remember that microfilm's average space reduction factor is ten to one and that the average filing cabinet costs $29 per year to maintain. There is a lot of difference between a cabinet that costs $29 and one containing the same amount of data on microfilm that only costs $2.90 per year to maintain.

The efficiency breakthrough didn't come just because more people began using microfilm. There were some very decided developments in microfilm that expanded its application range enormously.

Aperture cards

One was the advent of the aperture card — an electric accounting machine card which can be coded for sorting or collating equipment and in which a single frame of microfilm can be inserted. With the invention and development of this card, retrieval could be automated. Now, any one of thousands of engineering drawings or cards can be selected from a file in seconds and placed in the hands of an engineer or draftsman for reference — a job that might take hours to perform manually.

The Redstone Arsenal has over two million

Search for an engineering drawing at The Miehle Company, Chicago, begins with sorting aperture cards which are color coded for the seven basic printing presses involved and alphabetized according to parts.

Using a Filmsort card the engineer gets immediate viewing of the drawing concerned on a "Filmac 100" reader-printer. Then by pushing a button, he gets an 8½" x 11" print in less than ten seconds.

drawings on microfilm, any one of which can be instantly retrieved and can be printed out in virtually any form desired.

This is modern microfilm.

But the aperture card doesn't have to be automated to be effective. Many less complex operations, business firms and small offices, have mounted microfilm in aperture cards for manual retrieval because of the ease and convenience of handling originals. One firm, which deals in extensive international operations, now send Filmsort aperture cards containing microfilmed engineering data by first class mail overseas in half the time it took to ship originals — and they are saving $12,000 a year on postage, almost as much as it cost to make up technical prints of the drawings in the first place.

Relation to data processing

Relating the development of the aperture card to data processing — a duplicate of the card containing the microfilm is often made to serve as a master inventory and control card. This card, an exact duplicate in punched information, does not contain any film, but it can be helpful in providing high speed print-out of data in applications where frequent updating and correction of material is essential. For instance, these master cards can be used in high speed printers to prepare drawing lists, parts lists or bibliographical listings of all pertinent drawings or documents in the aperture card file.

In many cases, microfilm can be a great aid in prolonging the life of original documents — intricate engineering drawings, for instance. Constant reference and usage will greatly reduce the life span of a drawing, yet on microfilm there is no such problem since hundreds of references can be made without danger of wrinkling, tearing, or misfiling the originals. If necessary, a duplicate aperture card can be made in just a few seconds on inexpensive table-top duplicators for out-of-department use — at a fraction of the cost of original document replacement.

Westinghouse, in its giant East Pittsburgh division, has saved a considerable amount of money by making original tracings on less expensive paper rather than on tracing films or cloths. With microfilming serving as the working copy for reference purposes, reference and thus destructive wear to some 20 million square feet of original engineering data has been greatly reduced.

Reader printers

Another major development in making microfilm easier to use was the development of inexpensive reader-printers and high speed printers that can produce working copies of microfilm records in just a few seconds, automatically. While the aperture card automated or simplified the filing and retrieval of microfilm, it took the automatic reader-printer to make prints instantly available. The disadvantages created by reference on ordinary viewers, and the delays caused by print-out on inconveniently located units, have largely been eliminated by the development of these new units.

Our company was the pioneer in the development of reader-printers and since their introduction to the market just three years ago, microfilm has found application in such diverse markets as

hotels, cemeteries, drug stores, mail order houses, police departments, department stores and many others. These units — marketed under the Filmac trade name — produce either 8½" x 11" or 18" x 24" prints and require no operator training or special skills. This is a significant milestone because of past problems in the transport of material to and from central reproduction areas, unskilled operators who damaged film and produced poor prints, causing costly away-from-table engineering time.

So far the developments I have mentioned have largely been tied to the use of unitized microfilm — its separation and insertion in cards and jackets.

Indexing reel form microfilm

Much microfilm, however, is still maintained in the familiar reel form and there also have been recent developments in indexing this form of microfilm for faster, more efficient retrieval. These methods involve indexing of individual frames using digital codes or scan lines which can be used on special readers to produce a given image for the viewer in a matter of seconds.

This development has given new life to the many users of reel microfilm who want fast retrieval. On the other hand, the aperture card user would find the reel system impractical because of the normally high frequency of use and the need for updating information — cards being easier to edit and replace than data on reels.

The aperture card has made further advances — into the area of data processing output in a dramatic development in the computer field. One firm has developed a computer which can be programmed with information and used to produce design information in the form of filmed images which can be mounted into aperture cards, resulting in working prints of desired engineering data in a remarkably short time.

Records filmed from CRT

Another dramatic development concerns reel film and computer output. The division of accounting operations of the Social Security Administration in Baltimore is so completely automated that many records never appear in paper form at any point in the operation. Many firms now supply Social Security with data on employees' quarterly earning reports on magnetic tape. These data reports are processed in the computer and the newly updated account records are converted to readable form on a cathode ray tube and recorded directly on microfilm. This enables the division to arrive at the microfilm stage in their record keeping without going through the time-consuming process of printing from magnetic tape to paper listings then microfilming the paper output.

These developments have thus brought microfilm from passive to active — from idle record keeper to busy workhorse — and put it within the cost range of any business firm interested in more efficiency and lower operating costs.

I think it would be helpful to list here what we consider the eight major categories of both active and passive microfilm application:

Duplicating — Speed, low cost, and long life all contribute to the use of microfilm for the recording of vital statistics and technical information which may have to be quickly and economically duplicated many times over a number of years.

Consolidated filing — Here microfilm is used because of its low cost and its capability of making large files more useful by consolidating complete records in a reduced size with current papers. Examples are the filing of medical records and personnel records. Because the files are consolidated, access to information is faster and easier.

Retrieval — Because large amounts of information can best be stored in a small volume on microfilm and a given item found rapidly by machine sorting of film in card form or rapid scanning of indexed reels, the use of microfilm for rapid retrieval of information is steadily becoming more important.

Copying — Microfilm is used by banks, retail stores, and other businesses for the rapid copying of checks, sales slips, and statements. It is used because it is the fastest and least expensive method of copying a large number of documents.

Publishing — Microfilm is used for the low cost, high quality publication of rare books, research theses, and special periodicals.

Communication — "V-mail" was an example of the use of microfilm for the low cost, rapid transporting of information in quantity. A typical current use is the transmission of branch office reports to the home office.

Preservation — Microfilm is used to record valuable files of newspapers, engineering drawings, and other documents because paper cannot stand the wear and tear of years of use.

Storage — Experts say 40% of what is being kept in most offices should be destroyed, however, low costs of recording and storage are prime features of microfilm for keeping vital corporate records.

Development is proceeding at a high rate in many firms, and thousands of dollars are being spent to make microfilm even more useful for the office manager and systems man interested in im-

proving and modernizing his operation.

The future looks bright indeed, but my concern is not so much with the developments that will be made five years hence as it is with the people who are not yet aware of what microfilm could have done for them these past five years.

In other words, even the simplest application — filing and retrieval of data manually from reels or aperture cards — hasn't been adopted by many firms who could be saving themselves thousands of dollars each year. Further, many firms have existing data processing equipment which could be easily adapted for a microfilm system to provide retrieval of information in less time and at an expenditure of less energy than under any other method.

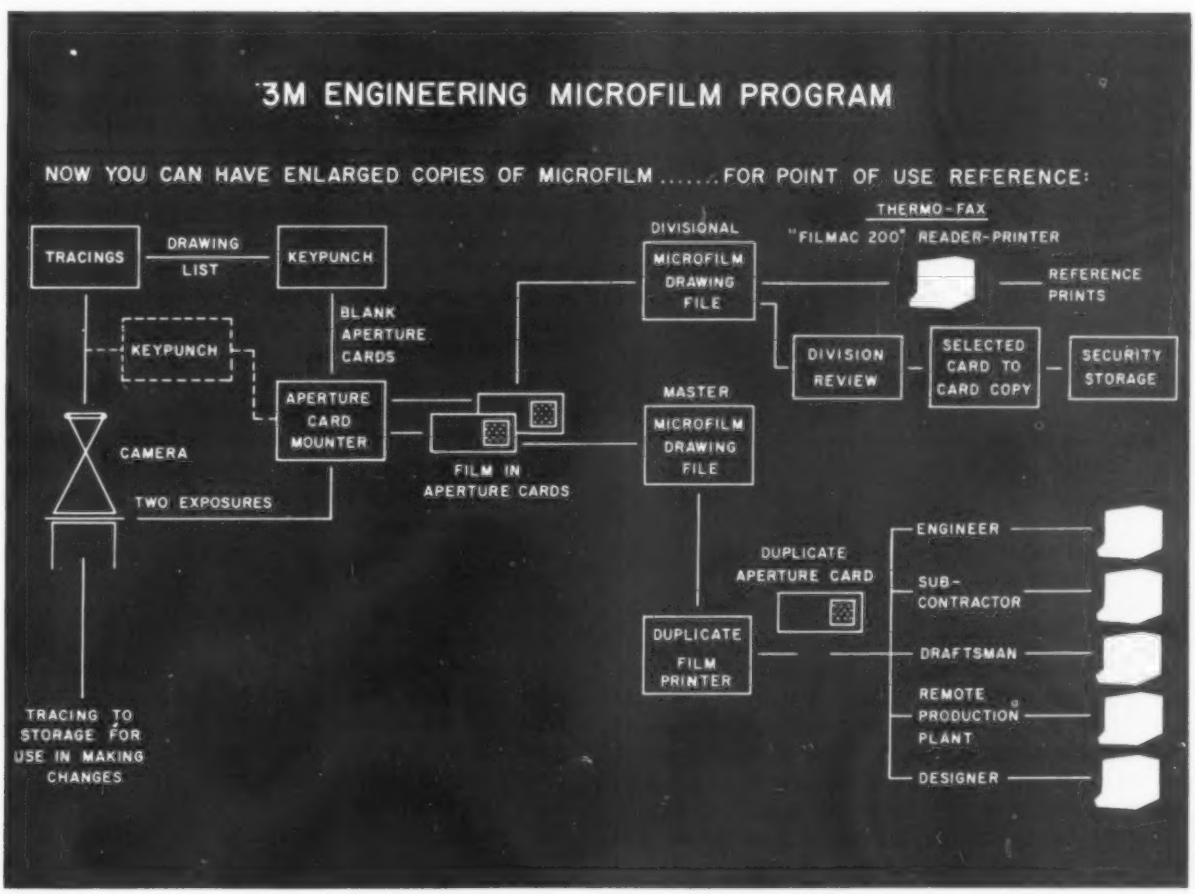
In its broadest possible future application, microfilm will replace paper. Students and scholars look forward to the day when library research time can be reduced and study from cumbersome volumes will be replaced by efficient research of information recorded on microfilm. Offices will have automatic filing programs of all incoming correspondence, reports and invoices, so that originals can be eliminated as soon as initial action has been started.

Experts indicate that the use of microfilm to maintain personal correspondence, telephone directories, encyclopedias, books, vital records, insurance and real estate papers, mail order catalogs and other items is at hand — some are already in use.

The cost is low.

Microfilm can do for pennies what it costs dollars to do in paperwork. But the real point is that the microfilm equipment that can do a masterful job of streamlining your files is already available. What we have to do now is put it to use — we have to evaluate microfilm's potential.

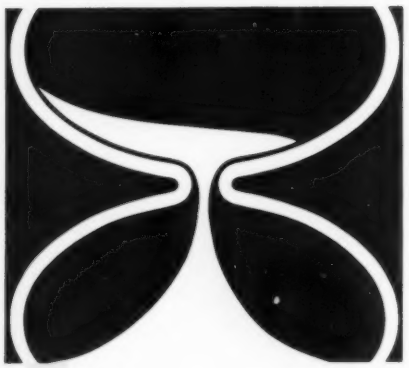
Only when you see what it can do will you begin to reap the rich harvest of efficiency, speed and economy that modern microfilm holds. ■



Minnesota Mining and Manufacturing Company has adopted an extensive engineering drawing microfilm program involving aperture cards and automatic reader-printers for printout.

Two aperture cards are made of each drawing. One goes to the division concerned for filing and use. The master, and any duplicates made from it, are for overall company use as well as any outside engineering needs.

By Henry M. Boettinger



The place of AUTOMATION IN HISTORY

Economic and social implications

IT IS ONE OF THE CLICHES of our literature that automation is accounting for the phenomenon known as the second Industrial Revolution. Even if our examination proves that this is not a second Industrial Revolution, analysis is necessary because if people abstract from the first Industrial Revolution factors that are not pertinent to the second, or if they extract the wrong things, it would be a bad miscalculation for policy determination.

I think the first thing we might say about the first Industrial Revolution is that it was a change from a stable agricultural and commercial society to a society of the modern industrial type.

A few years before the revolution took place (1600) the population of Europe was 100 million people; a century later it had risen to 152 million and in 1789 it numbered 173 million. This was the era in which all of our traditions and history were shaped. By 1934 Europe had 525 million people. Between 1789 and 1934 we see a tremendous sharpening in the population of Europe. We know that Europe was on the edge of subsistence in the earlier years. It was only by violent changes in both structure and methods of production, with accompanying social changes, that this population could be supported.

Machines for muscles

One characteristic of the Industrial Revolution was an organization of production in which machines were substituted for muscle. Present day automation proposes substitution of machines for some areas of the production process in which man's mind was the only suitable instrument. Another factor of the Industrial Revolution was the lag involved. In England it started around 1789 with the perfection of the Watt steam engine. France kept pace with England for a time but, interrupted by the French Revolution, it was set back many years. Only recently has French industry climbed somewhat on a par with the English. In Germany the Industrial Revolution is sometimes dated from the formation of the customs union which made an economic unity of the German state prior to its political unity. In Japan the Industrial Revolution did not occur until the late 19th century, and continued into the earliest years of the 20th century. In fact, Japan is considered by some to be in the latter stages of its industrial emergence today. The United States did not feel the great impact of the Industrial Revolution until after the Civil War. Here we should note the important fact that our Industrial Revolution took place on the base of imported technology and capital. The United States, a debtor country up to 1914, played a role in industrialization similar to the role that Russia enjoys today, which was the absorption of technology full born —not developed on the premises.

Position reversed

One of our problems today is that instead of being the follower by 100 years of industrialization, we are the leaders in the revolution of automation. This means that we must be prepared for greater waste, for greater frustrations and for, in the end, more expense per success because we are operating as the innovators. Other countries, if we can learn from England, will be taking our devices and it will be in the nature of the world that we must be prepared to accept this.

Now we also have a differing social impact. The first Industrial Revolution resulted in the lifting of much of the burden of sweat and toil from the population. For the first time men could see the possibility of not having to grub for their subsistence on inadequate agricultural land. In fact, had the population not increased so rapidly, those people who had existed at the beginning would have been far better off. However, a great deal of the product and the growth of the Industrial Revolution resulted in population increases which made per capita increases in income harder to achieve. To this extent it was self-defeating.

In this age we are proposing to lift the burden

of a clean, office, routine-type job. We cannot expect the same kind of welcome for such a contribution and it will be a great problem for us to explain how we are benefiting people by taking them off things that they enjoy doing. They *will* be taken off because—and here I'd like to quote Dr. Weiner (the first man to coin the term *cybernetics* and author of the first book which showed the great similarity in communications between animals, men, machines, the nervous system and computing systems)—who said *as long as man competes with machines, he must accept the wage of machine.* This inevitable erosion of position will displace people.

One of the other factors complicating our use of these arts is the general time lag between what we would consider the frontiers of science, say, pure mathematics, and technology applications. The machines in the Industrial Revolution, no matter how elaborate or large, were at best modified principles or embodiment of principles well known to Archimedes, and at their most sophisticated, employed principles which were well known to Galileo.

Now courses in Laplace Transform are taught. This great conceptual tool of Servo theory is only a little over 100 years old. It is being used in industry every day. Also, consider transistor technology. The transistor in fact originated as a series of laboratory experiments designed to test some inferences of the quantum theory. Here we have the shortening from 2000 to 100 to 50 years of the gap between the ultimate frontiers of knowledge and applications in industrial enterprises—some of great magnitude. Here we have a 500 million transistor industry from something which was nonexistent in 1948. This rapid obsolescence poses a social problem, for we must face the inevitable fact that our advances and triumphs will be superseded rapidly by other innovations.

Are we at crossroads?

Are we truly at a turning point in history? We are at a crossroads, but is it a significant crossroad or not? A turning point could be considered by some as occurring at a time when a great confluence of forces take place. Here are some of the facts which make a turning point in our arrangement of production.

First of all, we have a tremendous body of technology based on the techniques of radar in World War II. One could not find an article on radar prior to 1936. The electronic techniques using well-known components to handle and shape pulses, to trigger and time them, and so on, all grew out of this idea. The operational amplifier, which is the heart of the analog computer, dates from about 1938, little more than two decades ago.

Secondly, the industrial growth demanded of our economy has been based primarily on the substitution of mechanism for muscle, and in the second step of more efficient mechanism for the prior mechanism, and so on. It becomes obvious that this type of substitution is subject to reverse compound interest. We have a tremendous need for industrial and national growth coupled with a greater base and tougher opportunity to make it by our traditional techniques.

As a consequence, the complexity of modern industry has grown so that the paperwork and control costs have soared out of all proportion to the product or to the amount of horsepower required per unit. Consequently, the tremendous burden of clerical costs is offering a great economic incentive for the application of new techniques.

Also the electronics industry now exists and is now willing and ready to supply any type of product which is demanded.

These four forces—radar techniques, industrial growth, pressure of clerical costs on the entire factor cost of production, and the alert and sophisticated electronics and business machine industry—make a possibility of a turning point in history.

Business cycle problem

One of the great central economic problems of our day is the control of the business cycle. It is fundamental that if information is better, decisions are based on more precise assumptions. The business cycle was unknown to the world until the high development of industrialized society. The subsistence economy where people live from day to day knows no cycle. Its only crisis is famine. Not until surplus production was possible could we have a business cycle. There are hundreds of theories as to why we have cycles, their one agreement being that there is an element of miscalculation by the organizers of business in the prediction of demand, and the resulting imbalance of supply with demand, the falling prices, and the dislocation of inflexible capital all have cumulative effects. We *can* say that miscalculation assumes that something was miscalculated with.

When we look at the economy as an electrical engineer might, we would see a huge Servo-mechanism with very large feedback loops, very slow, and full of built-in instabilities. A mechanical engineer might look at it as a machine of extreme complexity but with a few links made of rubber. One of the greatest rubber elements in this machine is credit.

Servo theory

Let's look at the other aspects of the Servo theory. That would be Leontief's work on the input-output tables. These postulate closed loops. In other words, my business is an output to you and your business is an input to me. To close the loops

and make them more narrow requires more correct input and faster information. Just think what it would mean if we could have better information on which to base decisions. Could we mitigate the cycle? We are going to *have* to mitigate it because our economy demands it.

We have a rate of high optional spending. Dr. Nadler of New York University says that it may be as high as 50 per cent in this country. This means that no longer can we predict with certainty what people need. It is now more important to predict what they want. If we miscalculate in this environment too often, the possibility is raised that our whole system of private enterprise is in danger. This is so because unemployment, the central problem of our economy, is going to be solved by one means or another and if it is felt that the business community has not solved it, other political expedients will be tried.

Perhaps this problem might be solved by ideas not thought of before. For instance, two schools of economic thought say that business cycles are implicit in the capitalistic form of production. The Russians make a great to-do about this and say that our ultimate cataclysm will be one huge business cycle from which we can't recover. The Federal Reserve assumptions and the latter school of economists say that this can be solved if government credit manipulation and injections of Capital in public works are made at the right time. All of these tools and the Federal Reserve apparatus can be used, with all of their ramifications, but these are crude, after-the-fact, and very cumbersome. Banks respond to Federal Reserve policy changes in different ways depending on reserve position, bank loans, portfolios, etc., so that even though the Federal Reserve may like to do something, the actual situation may prevent it from being really effective.

What does this mean? We have a potentially more volatile economy, a larger population, many more affected by the swings in production and an almost nervous concern with the political aspects of unemployment.

The inventory problem

Now the inventory problem. What would happen if production swings were minimized? This would mean that we could level out inventories and could prevent the building up of surpluses and the liquidation of them as was done in 1958. This would mean that seasonal and working capital needs of industry may be reduced by as high as 20 per cent.

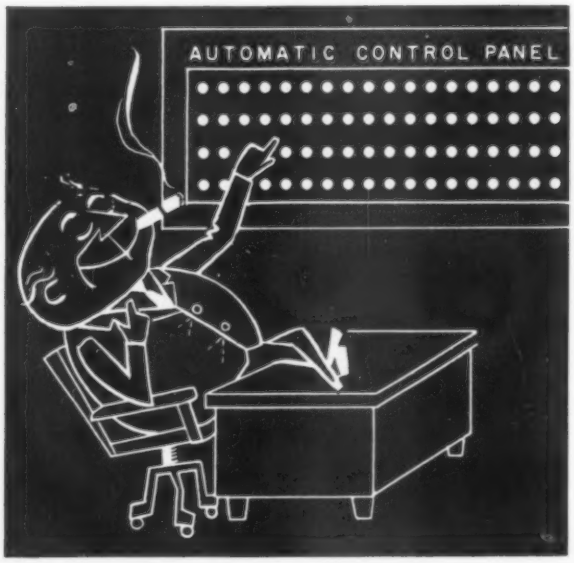
What about the automation of factories? Tremendous investment is required to automate a factory. The long runs of production necessary to get lower unit costs must be of the correct products. To design an automated factory or process which is most efficient for a single product but which cannot adapt itself to changes in demands or style, etc., may be the wrong type to build. Attention to the flexibility of the system is not only a good, sound technical idea but also a very first-class social aim.

Social change

One of the lessons we can learn from the first Industrial Revolution is that, as we look back from our perspective, the social changes resulting from this revolution were far greater and more far-reaching than the industrial changes. In fact, you might say that the map of Europe was made in the Industrial Revolution. The political systems certainly were influenced by these factors. It would have been impossible for anyone to see the situation from the viewpoint of some inventor putting in a spinning jenny, a flying shuttle or something of that kind. We are probably in the same situation as he at this time. As eminent a champion of Britain as Winston Churchill says that *the social response of the governments of England to these problems was amateurish and confused.*

Perhaps we can learn a lesson here that these little inklings—the little punched card payroll job, the use of magnetic ink, of optical scanners, of magnetic tape, of all kinds of devices—are in the same nature as the spinning jenny, the cotton gin and their technical cousins, and it might be salutary for us to think in terms of what we're starting here.

Will this be true again? It probably will. What can we do to help this? The first consideration is not to get lost in the detail of the job. We know the endless fascination attached to putting in a mechanized system, the tremendous exhileration one gets from the solution of problems which have never been solved elegantly in the past. It is so



easy for us to become intrigued with machines as machines and to forget that they are a means to an end, not an end in themselves. If we do this we are denying from the solution of this problem the best brains of people most able to evaluate its impact—people like yourselves. You can think of any number of examples where a tense social situation in the plant, office, or factory could have been avoided by a slight change in organization of the material, or the work flow, or the routine of processing.

Look at the whole problem rather than the mere question of whether we put this in column 60 or 67 and so on. Look at the entire production of the information system and its impact on our human needs. After all, all production systems and all office systems ultimately are to deal with the welfare of people, whether it be our people in the plant or the national economy and its supported population.

We are very fortunate to be in on this particular development now. It is exciting and so rapidly changing as to be breathtaking. We are at a point where each of us must specialize in his own area. This would not have been true of a new science for 150 years.

Frontier of the mind

Now we are at a certain frontier of the mind instead of the land. The frontiers on which we work are the frontiers of new combinations of old things, to solve the problem that has never been solved before, to come up with a combination of our own intelligence, our own knowledge of the need, and to apply our principles and apparatus to those needs.

Summing up the position of automation's place in history is the sentence from Victor Hugo's **History of Crime**: . . . *more powerful than armies is an idea whose time has come.* Whether or not this idea of automation's time has come depends a great deal on forces outside our control, but it will also depend in a great measure on the actions of those of us who are charged by our industries with the introduction of these ideas. If the idea's time has not come, at the very least we will be preparing the field.

In his **History of Europe**, H. A. L. Fisher said, concerning the thoughts which *should* have been in the minds of the nations' leaders at the beginning of the Industrial Revolution: *New forces are at work, old ways are crumbling, the people are restless and on the move. Children are at work in factories, dirty towns spring up in once green fields. We are in a different world and it is up to us alone to understand this new thing—to forestall its dangers, to anticipate its needs, and to guide its course."* ■

From a speech to the National Conference on Banking Automation, Detroit, Michigan, sponsored by the Detroit Research Institute.

Easy Addressing

Pressure-sensitive labels utilize data and equipment.

MANY COMPANIES are utilizing existing input data and equipment to produce useful by-product output, usable in many ways. One popular medium is the pressure sensitive label which can be used for mailings, catalogue preparation, parts assembly, and a dozen other jobs. With these self-sticking labels as the intermediate step, it is possible to extract information from punched cards or tapes and apply it for numerous purposes.

Customer names on punched cards can be transferred to envelopes for mailing, to files for change of address, for packaging and general labelling. By activating from punched cards, punched paper tape or by Flexowriter, labels such as the Able-Stik *(Allen Hollander Company)* can be produced in rolls or fanfold. Rolls are less popular as they have to be rewound and require a spindle, but the fanfold labels can be removed in sequence simply by turning over the batch. These are printed at normal machine speeds, feeding directly out of their carton and automatically refold like any paper forms.

Pressure sensitive labels are backed with live adhesive, easily peeled from the backing. The adhesive will stick to almost any smooth, dry surface with no further preparation.

For instance, magnetic tape identification for computer use is accomplished with specially printed pressure-sensitive labels. The librarian selects the correct tape according to job instructions, fills in file numbers and pay period on the label. The label and job instructions go to the computer room. As the tape is being run the operator opens the unit, puts the label on the reel, then removes the reel *(thus insuring that the correct label goes on the reel)*. The rest of the information is entered on the label for future reference. This becomes an aid to automation.

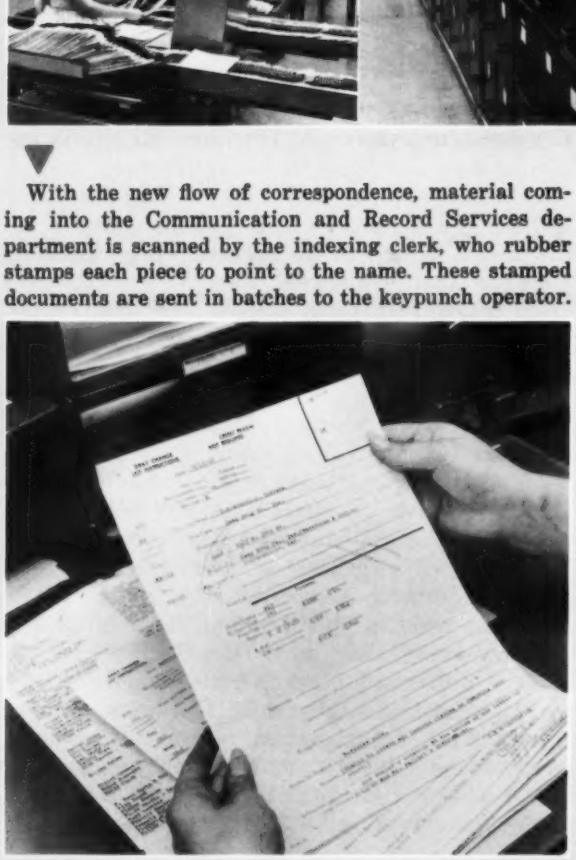
Pin feed pressure-sensitive labels are being used for addressing, correcting, marking and other purposes in accounting, bookkeeping, catalogue preparation, inventory control, invoice processing, list compiling and maintenance, methods planning, order processing, packaging, parts assembly, production scheduling and control, sales records, proxy lists, merchandise identification, parts bins, and almost anything that can be tagged.

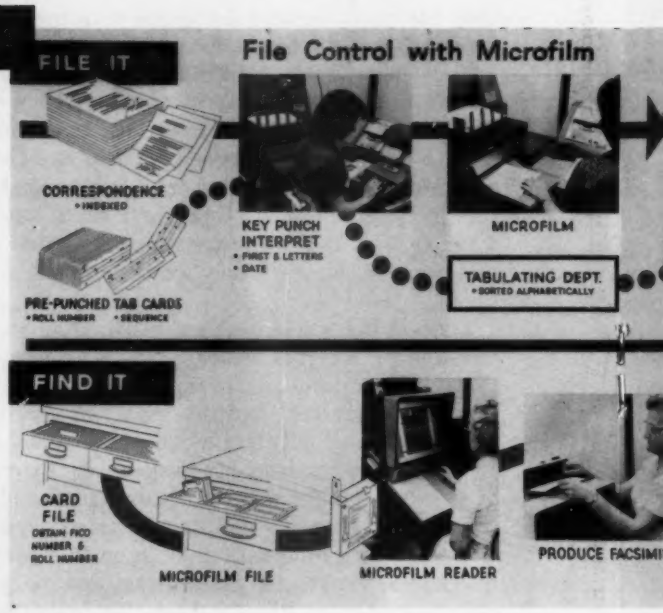
Some of the machines which can handle pressure sensitive pin feed labels are IBM printers, Ramac, Remington Rand tabulators, Synchro-Tape typewriters, Univac, NCR Postronic, Friden Flexowriter, Underwood Data-Flo, Bendix, Clary, Datamatic, Philco Transac, RCA 501, Robotypers, Royal, and Teletype. ■

APPLICATION OF THE MONTH

It used to take many large cabinets to house the correspondence at Eastman Kodak Company; although relatively efficient, the system was bulky and required a good deal of floor space, filing equipment, and time. The new system, using microfilm and punched cards, has reduced the annual expense of operating correspondence files by about 30 per cent, reduced expense of filing and sorting equipment by 45 per cent, and improved control while saving floor space.

With the new flow of correspondence, material coming into the Communication and Record Services department is scanned by the indexing clerk, who rubber stamps each piece to point to the name. These stamped documents are sent in batches to the keypunch operator.





THE FIle CO n

Recordak FICO system uses punched cards

Prepunched cards sequentially numbered from one to 3000, to correspond to the number of images on a 100 foot roll of microfilm, by the data processing department, are furnished the keypunch operator. Each batch of cards also contains a common roll number. The operator takes each piece of correspondence and keypunches the first five letters of the name *(file code)* and the date into a corresponding card.

The desired document is copied by exposing sensitized paper, which when processed is a copy ready for the requestor. With FICO, all correspondence since the beginning of 1960 is housed in one file drawer of microfilm; this involves 17,000 to 20,000 documents every 28 day period.

To find the desired document the proper roll of film is placed in the reader where the Kodamatic lines move up the code scale along the sides of the screen allowing the operator to locate the proper document in seconds.

Developments such as automatic indexing, film magazines which eliminate film threading into viewers, and printers able to produce copies in less-than-a-minute, make the system possible.

O ntrol SYSTEM

cards and microfilm for correspondence filing.

The document is put in the Reliant Microfilmer *(at operator's immediate left)*, and the operator continues repeating the operation for each piece of correspondence. When the sequence number of the card reaches an even 10 *(10, 20, 30, etc.)* she changes the Kodamatic indexing dial, moving the code lines on film up 10 digits. She also selects one of three exposures on exposure control for the various colors found in correspondence.

When all 3000 exposures are completed the film is sent for processing. The developed film is stored in a plastic magazine *(four inches square)* and stored in a file cabinet used as a stand for the Recordak Lodestar reader *(used in searching the files)*. The corresponding punched cards are sorted alphabetically by code and stored next to the film file cabinet. One drawer of cards equals one film. Every 28 days the entire card file is merged into a single alphabetic file for the period.

Using the punched cards as an index, the desired film roll number and sequence number can be obtained either manually or through sorting equipment.

Dreyfack on PERSONNEL —A Monthly Feature

RAYMOND DREYFACK

Mr. Manager:
How Technical Is Your Technique?

THE DAY OF THE VOODOO-motivated machine accountant is passing. No longer can you win your company letter by hypnotizing top management with your knowledge of class selectors, storage units and radioactive modular configurations. In other words, if technical drum-beating is your stock in trade, now is as good a time as any to revise your ways. Management is waking up.

Today's data processing manager has two prime responsibilities to himself and his employer. He must know the technical aspects of the job, naturally. But even more important, he must know how to manage.

Let's take Frank Jones as an example. Frank runs a three tab installation. Billing, sales analysis, inventory control, payroll, and 67 miscellaneous reports.

Monday morning in pops the head of the Cash Receipts department with a complaint, waving an invoice before Frank's nose.

"Believe it or not," he laments, "this is the eighth customer this month that paid, of all things, the invoice number at the bottom of the sheet."

"You're kidding," says Frank.

"Yeah? Look at this." He showed Frank the check.

Frank scratched his head. "There's only one answer. Let's make the invoice numbers larger. We'll get rich."

"Yuk, yuk," was the reply. "Frank, seriously, this is costing us time and money. I'd like you to print: *Pay This Amount* next to the invoice total. Can you do it?"

This was Frank's cue to go into Routine Voodoomystic. "Let's see," he mumbled, "no selectors left on the board, storage units all filled with account info, blah, blah, blah, mumbo jumbo and a shot of balderdash, etc." "Okay," he finally announced, "I'll work on it."

Later that afternoon Frank produces an invoice bearing the legend: *Pay This Amount* in neat juxtaposition to the invoice total.

"Hey, that's terrific!" raves the Cash Receipts man with undisguised admiration. "Thanks a lot, Frank."

Question: Does this make Frank a good machine accountant? First, let's give credit where due. Frank made the requested plugboard alteration without using a trailer card. He did some fancy wiring through channels and stuff to produce the desired result. Living proof of a good technician.

Good manager?

But is Frank a good manager? Let's explore deeper. Let's consider Joe Grady, Frank's senior tab operator for almost four years. His record is outstanding: loyal, dependable, hard-working kind of a guy. Until, all of a sudden—kerplop! Joe starts taking a dive. Errors on the job, excessive absence and lateness, a bitter argument with one of his coworkers.

At first Frank became mildly annoyed, then irritated. He called Joe on the carpet and pitched him out. Shifting uncomfortably, Joe promised to improve.

Joe didn't improve. Frank called him on the carpet again. This time he almost pulled it out from under him.

"If your work and attendance don't get better I'm sending you up to Personnel."

He meant it too. Frank's creed was to be firm and tough. He'd earn more respect that way and get better performance.

But Joe's performance declined even further. Frank kept his word. He marched Joe upstairs to Personnel.

Fortunately, Personnel saved the situation. As it turned out, Joe's wife was sick and his mother-in-law was caring for the kids. Old woman had her own health problems. This accounted for Joe's poor attendance. His work too. In Joe's spot the best worker would have faltered. The poor guy was up against it. He needed help. Personnel—the company—saw to it that he got help. Joe was straightened out. When he returned to the department he did his job competently as in the past.

But something new was added. In Joe's eyes his supervisor had let him down. He was grateful to the company for the help. He'd continue to be conscientious and hard-working because this was his nature, but from here on out, in Joe's book Frank was an NG guy. Maybe some day Frank would be sorry for this. Or, maybe he'd never know.

Technician

Was Frank a good manager? Definitely not. A competent technician, perhaps, but no more.

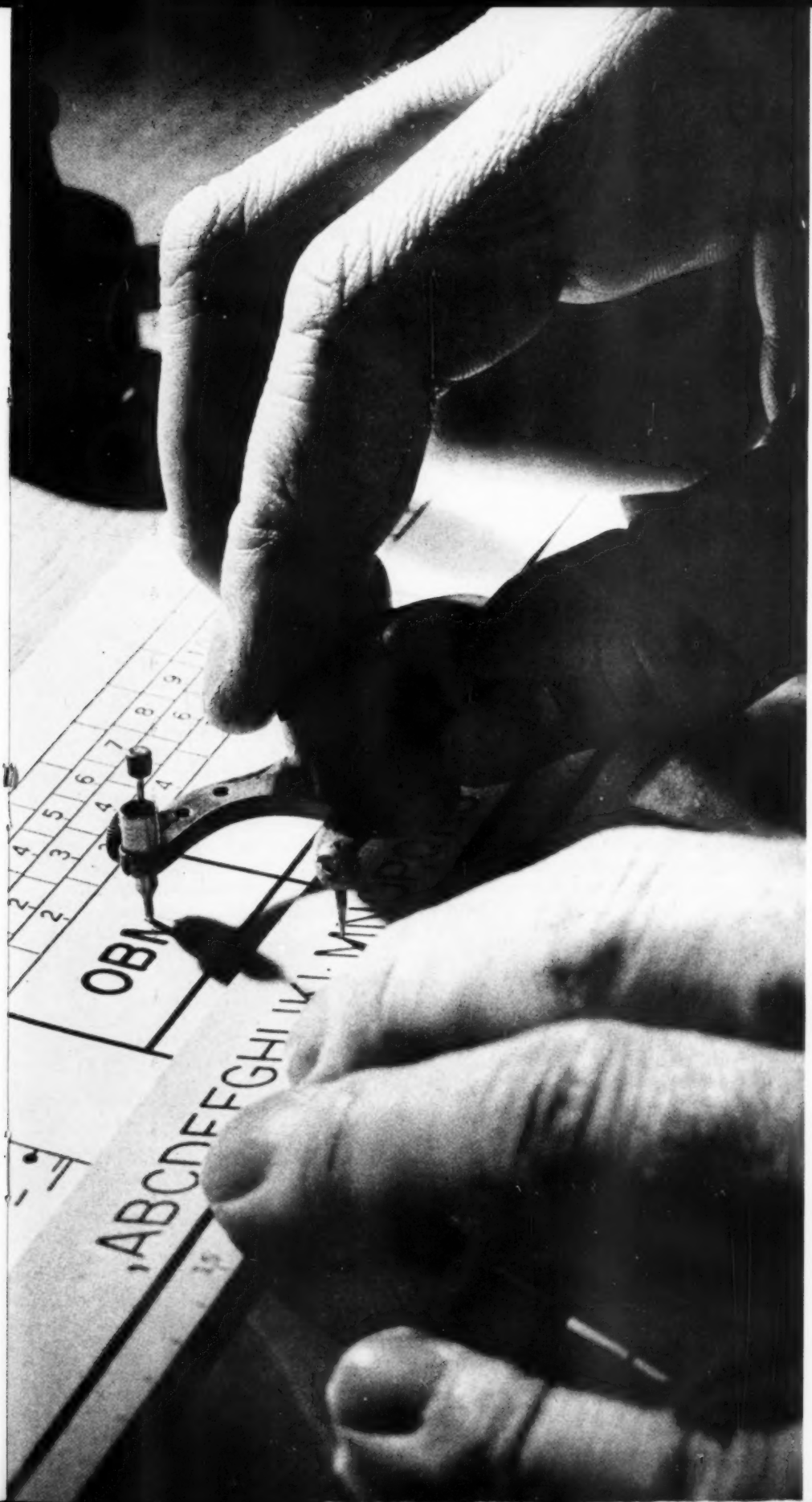
An employee's performance declines after four good years. Why? Trouble at home? Illness? Conflict on the job? Unfair treatment, real or imagined? There's always some answer. Frank didn't even bother to ask the questions.

So he's a good technician. So what? How far can a good technician—if that's all he is—advance himself, his company, his people?

There's Technical Quotient—TQ, and Management Quotient—MQ. TQ can be acquired by cracking a book. MQ is harder to come by. It comes through experience, an open-minded approach, through plain human decency and consideration for others.

I know a manager. He heads one of the largest EDP set-ups in the world. He doesn't remember how to wire a plugboard, and he couldn't program a computer personally. But he knows what his equipment can do, and he knows how to get it done through others. He understands his company's problems and objectives. Most important of all he understands people.

He's one of the best managers I know.■



THE CARD WITH SPECIAL BACKING

. . . in design

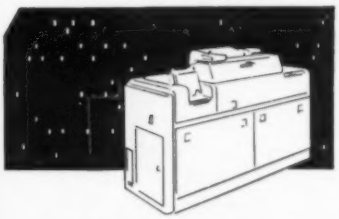
Proper card design can improve card-handling, speed and accuracy, reduce card consumption, and contribute greatly to the economy of your data processing operations.

To assist you in devising the *right* card format for each and every job, IBM maintains a nationwide network of Card Design Centers. The skilled personnel at each Center are thoroughly familiar with IBM's tremendous selection of standard and special cards, card sets, continuous forms, checks and special card features. This experience and know-how are at your disposal—to aid in the economical development of your own design ideas, to recommend existing formats where applicable, and to create entirely new designs tailored specifically to your needs. Additional design assistance is available through IBM's Sample Card Center, where thousands of actual card formats are on file, by industry and application. From sample cards, sent on request, you can study and profit by the ideas and the experience of others who have successfully solved card design problems similar to your own.

The IBM card is backed by QUALITY and SERVICE, too. Through its nationwide network of Card Plants and Warehouses . . . through its manufacturing experience and quality control, which are unparalleled in the industry . . . and through its Supplies Specialists and Sales Representatives, who know *both* card and machine requirements . . . the purchaser of IBM cards enjoys the finest in product performance and service.

This special backing makes the IBM card a value unsurpassed in the industry . . . and represents one more example of the way IBM helps you to enjoy Balanced Data Processing.

Circle No. 8 on Reader Service Card.



IBM. SUPPLIES

Coming Events

Dec. 13-15

Eastern Joint Computer Conference
Hotel New Yorker and the Manhattan Center
New York, N. Y.

1961

Jan. 16-19

ISA Winter Instrument-Automation Conference and Exhibit
Sheraton-Jefferson Hotel, Kiel Auditorium (exhibit),
St. Louis, Mo.
Contact: Wm. H. Kushnick, 313 6th Ave.
Pittsburgh 22, Pa.

February
(dates to be announced)

ISA Analysis Instrumentation Division's Seminar on Sample Handling
New Orleans, La.
Contact: E. A. Houser, Beckman Instruments, Inc.
Fullerton, Calif.

March 6-8

American Management Association Data Processing Conference
Statler Hilton Hotel
New York, N. Y.

March 27-31

Symposium on Temperature—Its Measurement and Control in Science and Industry
Sponsored by ISA, American Institute of Physics, National Bureau of Standards.
Veterans Memorial Auditorium,
Columbus, Ohio

April 4-6

National Microfilm Association 10th Annual Meeting and Convention
Sherman Hotel
Chicago, Illinois

April 17-21

Office Equipment Manufacturers Institute
New York Coliseum
New York, N. Y.
Contact: Wynne Keith (N. Y.) JUdson 2-2383
Ruth Burnham (Wash.) STerling 3-0788

James H. McGraw

NEW OFFICERS

Old Town Corporation has elected JAMES H. McGRAW III president, and JOHN C. QUINN, JR., executive vice president, at a recent board meeting.

CLARY

The new manager at the Washington, D. C. offices of Clary Corporation is RANDOLPH B. BISHOP.

BALTIMORE FORMS

CLYDE T. MARSHALL has been elected vice president of Baltimore Business Form, Inc., with headquarters in Baltimore.

REM-RAND

Appointment of GEOFFREY W. HELM as branch manager for the Univac sales office in Buffalo was announced.

HONEYWELL

New manager of the San Francisco branch sales office of Datamatic Division of Minneapolis Honeywell is THOMAS H. WILDER III.

PEOPLE AND PLACES

LFE

FREDERICK E. CARROLL has been promoted to the new post of operations manager, data storage operations, in the Computer Products division of Laboratory for Electronics, Inc.

SYSTEMS MAN OF THE YEAR

Systems & Procedures Association has named DR. GIBBS MYERS systems man of the year. He is manager of systems and procedures at the Kearfott division of General Precision, Inc., Little Falls, New Jersey.

AMA

American Management Association has named seven new members to the Planning Council: ALFRED J. APGAR, Buchanan, Mich.; MARTIN J. CREAN, Great Neck, N. Y.; HOWARD ELLIS, Wilmington, Del.; LIONEL E. GRIFFITH, Dover, Del.; L. R. HAGUE, Pittsburgh; LEONARD T. THOMASMA, Rochester, N. Y.; ROBERT H. HOWE, White Plains, N. Y.

RCA ANNOUNCEMENTS

EDWARD J. HART has been appointed manager of the RCA Microwave department.

GORDON F. ROGERS is now manager of advanced development for RCA communications.

BENDIX CHANGES

Dr. GILFORD G. QUARLES has been appointed to the new post of director for long-range military planning for the Bendix Corporation.

ROBERT A. SOERHOFF is now manager of the Dayton, Ohio office for the corporation.

CHARLES E. RUCKSTUHL has been named corporate representative in the Boston area.

CHARLES M. EDWARDS has been appointed western corporate representative.

A. F. Sammet

AUTONETICS

A. F. SAMMET has joined Autonetics, a division of North American Aviation, as assistant to the vice president of industrial products.

PHILCO

EDWARD C. BUURMA has been appointed northwest regional manager for Philco.

JAMES R. WEINER has been named vice president-engineering for Philco's Government and Industrial Group.

Teaching without Hardware

Teaching electronic data processing without a computer

SINCE THE SPRING SEMESTER OF 1957 the present writer has taught a course at the University of Alabama entitled "An Introduction to Electronic Data Processing." In the spring of 1959 a second course was inaugurated entitled "Statistical Analysis with Electronic Computers." For over a year now a three semester hour credit correspondence course *(patterned after the introductory course)* has been offered. This correspondence course presently has an enrollment of about 20 students from around the globe, and as far as we know, it is the first and only college credit correspondence course on electronic data processing in existence.

Perhaps the unique part of this account is not that three credit courses in electronic data processing are offered by a school of business administration *(though a few years ago it would have been quite unusual)*, but that these courses have been established and taught without an electronic digital computer within a radius of 60 miles from the University campus at Tuscaloosa. This should not be construed as meaning that a computer is not needed—far from it! *(We are still hopeful of obtaining financial support for a computer research center in the near future)*. It does indicate, however, what an educational institution can do as an interim measure sometimes in spite of the lack of adequate facilities. Our experience in this area to date indicates that the wheels of training in principles can commence turning long before the actual hardware arrives.

By Charles N. Moore

Furthermore, the knowledge of principles of computing and familiarity with programming learned by some faculty and students assures that when any equipment does become accessible it will be more readily and fully utilized. In addition, even though there was no equipment on the campus, some of our students graduating in recent years have had the opportunity to be indoctrinated to this new and important field and have not found their training inadequate solely because of lack of equipment. We are grateful to educational institutions in the area who were more fortunate in obtaining equipment and to certain industries who have been most generous in giving us free time on their equipment in order to give our students first hand experience in using the computers to solve their problems.

Background knowledge

Regarding the three credit courses mentioned previously, the objective is *not* to train computer operators or programmers. Rather, the courses are intended to give the students enough information *(and source material)* so they will be able to intelligently evaluate the impact and significance of electronic computers on the type of work for which they are being trained *(whether accounting, statistics, engineering, mathematics, etc.)*. As a minimum, a student should be able to discuss at the end of the courses both the advantages and limitations of electronic computers in general, and should be much less mystified by what they hear and read about "giant brains." The role and importance of trained and experienced persons in subject matter fields *(accounting, engineering, statistics, etc.)* for more fully exploiting these computers are stressed. As a result, the student's perspective of how he can utilize these tools in his particular field of work is much improved.

In each of the three courses *(particularly in the statistical analysis course)* students are required to program problems from definition to flow chart to instructions *(machine or pseudo)*. This is quite important, we feel, because it seems apparent that until programming is experienced first hand one never fully comprehends the problem of bridging the gap between the man who has a problem to solve, and the electronic computer which can per-

form with a high degree of proficiency the data processing part of the problem. Without programming experience one tends to be too gullible or too prone to debunk the work of an electronic computer.

Computer time loaned

Although in the classroom it has been possible to teach students the principles of computer operation and programming, one does not get a sense of completeness until he is able to carry a problem all the way through from definition to actual running on the computer. In order to do this, arrangements were made originally with the Rich Electronic Computer Center at Georgia Institute of Technology to actually run student problems on one of their three electronic computers. Although it would in general be preferable to have the student run his own problem on the computer, the distance from the University to Atlanta *(225 miles)* would preclude this as a practical arrangement. In lieu of this, the students' data and instructions in punched card form have either been mailed or taken over in person by the present writer. So that the students may actually run their own individual problems, arrangements have been made in recent months with Hayes Aircraft Corporation and Southern Bell Telephone Company in Birmingham *(60 miles away)* and with Mississippi State University *(82 miles away)* and in one afternoon *(and part of the night, if necessary)* about a dozen students can "get on the computer" and run their problems, "debug," and run them a second time, if necessary.

Field trips

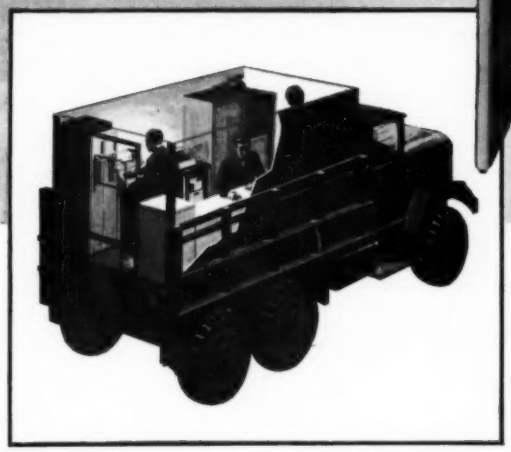
During each semester, at least one field trip is made to various locations in Alabama to enable the students to see several different computer systems in operation on a variety of different type computer problems. In past semesters students have visited the computation laboratory at Redstone Arsenal, which probably has the greatest concentration of all types of electronic *(analog and digital)* computers under one roof in the world. A trip to Birmingham makes it possible to see a variety of business and industrial applications of electronic computers *(from the IBM 650 at Southern Bell and Hayes Aircraft to the IBM 705 at Tennessee Coal and Iron Division of U. S. Steel)*. This past spring a field trip was made to Montgomery, the State Capital, where it was possible for the students to observe the Univac I in operation on a rather unique data processing problem *(processing correspondence course records)* at the Air University. They also observed the use of an IBM 650 at the Highway Department on "cut and fill" type civil engineering problems, and the use of an IBM Ramac by the State Comptroller.

Information coming back to the campus from several of our recent graduates indicates that even these introductory courses have had a significant effect on the direction and type of work they are doing. In several cases it was learned that the mere presence of a course in electronic data processing on the student's record initially attracted the attention of company interviewers. One student indicated that the information obtained in the introductory course was very helpful in an advanced stage of his interview at the company office in making it possible for him to effectively communicate with the employer and readily comprehend some of the problems the company was planning to solve with the aid of their new electronic computer. One of our recent accounting graduates accepted a job with a national public accounting firm and was scheduled to go into auditing. When it was learned that the new employee was familiar with electronic data processing he was given the opportunity to change over to the new and fast growing management services department. Another of our former students is teaching a similar course in electronic data processing for accounting students in one of the neighboring universities. Still another former student, a "business statistics" major, accepted a position with a large chemical company in the Southeast and was assigned to the accounting department as an "analyst." His background in statistics and his familiarity with electronic data processing *(obtained in the introductory course)* gave him a headstart over others in the department who had no previous knowledge of electronic computers. "Getting the jump" is just as important in the business world as in any game.

In conclusion, it has been our experience that it is not necessary for an educational institution, large or small, to deny students the opportunity to be informed concerning the "mysteries" of electronic computers just because one is not available on the campus. Although student and faculty research on a continuing basis which necessitates the use of an electronic computer is hardly feasible without the accessibility of a computer, we have found that it is both desirable and practical to offer introductory, and even problem solving courses. These courses serve to open the students' minds to both the potentialities and limitations of electronic computers, and often lead students to opportunities in this new and fast growing field which they might have ignored otherwise. In addition, when it is financially practical to purchase or rent an electronic computer for full time use in instruction and research, it should be possible for the educational institution which has even an introductory instructional program to exploit this powerful computing tool with a minimum of lost time and effort. ■

BASICPAC

Designed and built by PHILCO



A tactical computer for the Army's FIELDATA family of data processing devices

CHARACTERISTICS

General—General purpose, stored program • Medium to high speed • Binary, synchronous, serial by character, parallel by bit • Alphanumeric six-bit characters, FIELDATA Code

Operation Time per Word (including two access times)—Addition, 22 to 26 usecs • Multiplication and division, 238 to 242 usecs • Transfer of control, 16 usecs • Memory cycle, 12 usecs

Internal—Word length, 38 binary digits, including sign and parity • Arithmetic, signed magnitude, fixed point • FIELDATA Instruction Code, 40 orders • Index registers, four (expandable to seven) • Memory capacity, 4096 words (expandable to 28,672 words)

Input-Output—Control panel • keyboard and paper tape equipment • magnetic tape • line printer • punched card equipment • up to 54 I/O devices with up to seven operating simultaneously • real-time I/O—up to seven real-time input sources and seven real-time output sinks operating simultaneously with I/O equipments • FIELDATA language code and interface

Physical—Central Processor Weight, 609 lbs. • Volume, 17.8 cu. ft. • Environmental conditions, −35° C to +55° C, 0 to 97% relative humidity

Power Requirements—2.5 kilowatts (60 or 400 cycles)

Basicpac is a rugged, mobile, solid state data processing system being developed by Philco in conjunction with the U.S. Army Signal Corps, for use in forward area tactical situations. Basicpac will be a very important part of an integrated automatic data processing system for the entire field army . . . for such uses as logistics, administration, intelligence, command support and fire support.

Basicpac can be transported and operated in an S-109 shelter mounted on a 2½-ton truck or operated from a fixed installation. This unique system is designed to meet all military specifications for shelter mounted, air and truck transportable equipment and will be highly reliable, easily operated and maintained under extreme field conditions. Incorporated throughout the design are the latest technological advances in solid state circuitry and semiconductor components. This assures a compact, flexible and highly mobile data processing system completely adaptable to all the environmental and climatic extremes experienced by the military.

Basicpac will be delivered in December to the U.S. Army Signal Research and Development Laboratory for final acceptance testing.

A more informative brochure, plus technical assistance in adapting Basicpac to your requirement, are available. Write today.

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Circle No. 15 on Reader Service Card.

NCR 315 SYSTEM

National Cash Register's new Class 315 electronic data processing system is a solid-state, low-cost computer expansible from a basic system of limited capacity to a powerful full-scale system. The computer accepts and delivers large volumes of information in all common business-machine media at high speeds.

The main memory, the magnetic tape file and the input and output systems are all variable in size or capabilities to fit closely the requirements of the user.

New Equipment

The processor is available with five different memory sizes capable of storing 6,000 to 120,000 decimal digits or 4,000 to 80,000 alpha-numeric characters.

The system may include from one to eight magnetic tape files, each containing 3600 feet of ½-inch magnetic tape and capable of storing 21 million alpha-numeric characters or 31 million decimal digits of information.

The input system for the 315 may include up to four magnetic character sorter-readers, a punched card reader, a paper tape reader and the console typewriter as well as the magnetic tape handlers.

The output system may include up to four high-speed line printers and card punches in any combination, a paper tape punch, the console typewriter and the magnetic tape handlers.

Any input, output or memory components not incorporated in the original system may be added as required.

To permit maximum efficiency in the use of input and output units (time sharing), the peripheral units can interrupt a program automatically. The sorter-readers, the card punches, the card reader, and the high-speed line printers have the ability to interrupt the main program to demand processor attention when they have completed an operation previously assigned to them. Thus, the input-output units may be kept running at maximum rate, while the processor is performing some other job. Occasionally the main program will be interrupted for a brief interval to attend to one of the input-output units, and then immediately resume, while the slower unit continues to operate independently at its own speed. These features together enable the processor to coordinate the simultaneous operation of a number of peripheral units, each functioning continuously at its own rate of speed.

Unitized construction simplifies check-out and maintenance. Each unit has its own power supply and contains circuitry which provides a sequence of automatic reliability tests. Maintenance is made easier by control panel switches which quickly isolate the unit from the rest of the system.

Many large users of computers find it advantageous to acquire one large-scale and one small-scale computer with the smaller computer serving as an input-output converter and editor for the larger computer.

A large-memory 315 and a small-memory 315 serve this purpose with several advantages according to the manufacturer.

First, a tandem 315 system furnishes comparable capacity at lower cost than other two-computer systems.

Second, since both systems are identical except for memory size, the programming staff need learn only one machine.

Third, since both processors are the same, and since peripheral units may easily be switched from one processor to the other at different times during the day, the user has great flexibility in allocating work between the two systems.

And finally, each of the two 315 systems can provide back-up for the other.

Data processor

The processor is a solid-state, single-address processor of modular construction with an expandable memory capable of storing up to 120,000 decimal digits. It responds to a fully developed list of computer instructions. The basic cycle time is six micro-seconds.

The processor has 32 index registers and 32 jump registers. It has a directly addressable control register (instruction counter) and automatically stores up to three independent program links.

Sorter reader

The Pitney-Bowes National sorter-reader processes documents at the fixed rate of 750 per minute, regardless of size. It can operate either un-

der control of the processor or independently of the processor.

When the sorter-reader is connected to the processor, the sorter reads documents into the processor memory and may also make a 12-way distribution of the documents as directed by the processor program. The sorter-reader reads each document into its own buffer memory and then transmits the information to the processor at high speed. This leaves the processor free to do other work during more than 99 percent of the time the sorter-reader is operating.

The processor may control four sorter-readers at the same time.

When operating independently of the processor, the sorter sorts on a digital basis according to instructions set into its control panel.

The documents to be sorted may fall within a wide range of sizes. Even within a single run they may vary in width from 2½ to 4½ inches, in length from 5¼ to 10 inches and in thickness from .003 to .007 inches.

The sorter-reader reads the American Bankers Association's Type E-13B magnetic ink type font.

Punched card reader

The punched card reader photoelectrically reads all the columns or any selection of columns of a card at the rate of 400 cards per minute. The cards can be read singly, continuously or in batches of any quantity.

The reader can read any code, standard or non-standard, punched in the cards. This includes codes involving binary, multi-punch or split-column configurations. Reading always proceeds at full speed for any code since the card code is translated into the processor code while the reader is scanning between card columns.

The processor is free to do other work between card columns and also between cards.

Paper tape reader

The paper tape reader reads 1000 characters per second photoelectrically from five-, six-, seven-, or eight-channel tape. The system accepts any tape code at full speed, since the paper tape code is translated into processor code while the reader is scanning between characters. The tape stops between characters when reading is complete.

High speed printer

The high speed printer prints 680 lines of alpha-numeric characters a minute with 120 characters to a line. The unit can print 56 different characters and can produce an original and five copies. Forms may vary from four to 22 inches in width.

When numeric lines are printed, the printing rate automatically increases to 900 lines per minte. The skipping rate is 5040 lines per minute over any number of lines. Vertical format is controlled jointly by a punched plastic loop and by the processor.

A multiple-list attachment enables the printer to operate as three independent listers with separate paper transports on each.

Paper tape punch

The paper tape punch punches 120 characters per second in any desired output code. The tape may have five, six, seven or eight channels. Punching density is 10 characters per inch. The processor is free to do other work between characters.

Card punching

The 315 system will operate a standard 250 card per minute punch through National's card punch buffer. Any code configuration including binary, multi-punch, or split-column may be created in the system. Card punching is a completely time-shared operation.

Up to four card punches and printers in any combination may be operated by a 315 system.

Magnetic tape file

The 315 system may incorporate two different tape handler models, one capable of operating at a 40 kc transfer rate, the other capable of operating at 40 kc and 60 kc transfer rates. A transfer rate of 40 kc transmits 40,000 alpha-numeric characters or 60,000 digits per second; at a transfer rate of 60 kc, the figures become 60,000 and 90,000 respectively.

At the highest rate, the system stores 750 decimal digits in an inch of tape, almost 32 million decimal digits in a single reel. Each handler holds one reel of ½-inch Mylar tape 3600 feet long. Information is stored on the tape in variable length records containing from two to 16,000 alpha-numeric characters.

Both tape handlers are fully compatible with IBM magnetic tapes, reading and writing 200-character per inch tape at 24 kc.

A write-lockout system prevents writing on master file tapes. At the option of the operator, a use-lockout prevents writing on other tapes after rewinding.

As information is recorded on magnetic tape, it is read back and checked to insure that the writing was correct.

Up to eight magnetic files may be incorporated in a single system.

Console

The system console is a desk-type display unit which permits complete monitoring of the entire system. It provides a binary coded display of the main memory address and a complete indication of the cause of an error halt.

The operator can modify the program or cause the system to operate one cycle at a time through the console. Desired information can be printed out directly by the console printer.

Circle No. 30 on Reader Service Card.

IBM 1410 SYSTEM

The IBM 1410 is designed for customers who need a powerful, intermediate size, general purpose data processing system with in-line random access capabilities.

The new system comes in card and tape and in RAMAC card and RAMAC tape configurations. An expanded RAMAC 1410 can store as many as 100-million characters of business information for immediate access, while the smallest RAMAC 1410 will hold 10-million characters.

More than twice as fast in processing speed as the widely-accepted 1401, the 1410 has extremely high throughput. Optional features provide complete overlap of read/write/compute.

Systems modularity

Both the 1410 and the 1401 are designed on the modular or building-block principle, utilizing similar input/output and RAMAC units. The more powerful 1410 provides a com-

(continued on next page)

patible growth range for the 1401 and can use most 1401 programs without revision.

The heart of the 1410 system is the 1411 processing unit which provides magnetic core storage for ten, twenty or forty thousand alphameric characters. Storage circuits are capable of reading out more than 200,000 characters a second. The unit can perform up to 1,800,000 logical decisions, 600,000 additions or subtractions, 60,000 multiplications or 40,000 divisions per minute. Direct multiplication and division are standard features. Character transfer rate in memory is 4.5 microseconds.

Additional storage is offered by the 1405 disk storage units. The units hold either 10-million or 20-million characters and as many as five storage units in any combination may be employed by the system. A maximum of three access arms may be installed on each file for increased speed and flexibility in disk read and write operations. The system may have a total of twelve access arms.

Additional features

While the 1410 retains the basic concepts of the 1401, such as variable instruction length and print edit, it also contains additional features.

These include — in addition to higher processing speeds, increased storage capacity and greater overlap—a table search feature which permits a single instruction to search an entire area and fifteen indexing registers (or fifteen ways to modify each instruction if an exception is encountered in the course of operations).

A special feature of the 1410 is a second data channel for magnetic tape and/or RAMAC input or output. Functions on the second channel can be performed independently of those on the first. While read/compute and write/compute may be carried out on one channel, it is possible to have complete overlap of reading, computing and writing with two channels in operation.

The basic components of the 1410, besides the 1411 central processing unit and the 1415 console, are the 1414 input/output synchronizer, the 1403 printer and the 1402 card read punch. The last two are also basic components of the 1401.

The 1415 console is for operator control and communication with the entire system. The console will print out any information contained in storage, either in full or on an exception basis.

The 1414 synchronizers permit the attachment of magnetic tape, paper tape, card and printer equipment. The new low-cost IBM 7330 magnetic tape units, the standard IBM 729 IIs or 729 IVs, or all three, may be used during the same operation. The 7330s and 729s cannot be used on the same data channel; 729 IIs and 729 IVs may be intermixed.

The 1410 can handle ten tape units on each channel, or a total of twenty tape units in all. At least one synchronizer is required with each 1410, the model depending on the choice of input/output units.

The high-speed 1402 card read punch reads cards at the maximum rate of 800 cards per minute and punches output cards at the rate of 250 per minute.

The 1403 printer, another proved component, prints at a speed of 600 lines per minute, skipping between printed lines at sixty times the speed of printing. Printing is by means of a swiftly moving chain of engraved type faces.

Also available with the 1410 is the new IBM 1011 paper tape reader. The 1011 reads five, six, seven or eight channel tape directly into the system without prior conversion to punched cards or magnetic tape. Paper tape is generated by a wide variety of IBM machines and by teletype.

A powerful addition to the 1410 for banking applications is the IBM 1412 magnetic character reader. This component is capable of reading data from checks into the system at speeds as high as 950 checks a minute. Two 1412s may be coupled with the 1410 on separate data channels for a powerful and complete banking system.

Applications

The 1410 has a wide number of applications in many fields. Areas in which the 1410 can be used to advantage include: general manufacturing; federal, state and local government; retail; chain and wholesale; banking and finance; brokerage; petroleum; public utilities; life insurance; fire and casualty insurance; communications; education; textiles; and transportation.

An especially significant use for the 1410 is in MOS, IBM's Management Operating System for the basic manufacturing industries. The objective of MOS is the control of production cycle functions from start to finish. These basic functions, common to all manufacturing, are sales forecasting, materials planning, inventory management, plant scheduling, work dispatching and operations evaluation.

The 1410 is the ideal MOS tool because of its large RAMAC capacity —needed for such functions as inventory management—its high cal-

culating speeds and multi-channel operations for fast throughput.

Some typical applications for the 1410 are:

INDUSTRY	APPLICATION
Banking	Demand Deposit Accounting Loan Accounting Audit and Control of Income
Brokerage	Brokerage Accounting
Chain and Wholesale	Billing and Inventory Grocery Drug Hardware
Communication	Billing and Revenue Accounting
Education	Student Scheduling
Federal Government	Finance Accounting Industrial Accounting Maintenance Personnel Accounting Supply Logistics
Fire and Casualty Insurance	Policy Rating and Renewal Writing Agents Experience Premium Distribution Master in Force File
Life Insurance	Consolidated Functions
Petroleum	Retail and Wholesale Accounting
Retail	Merchandise Control Billing and Accounts Receivable
State and Local Government	Motor Vehicle Registration Employment Security Tax Accounting Appropriation Accounting
Transportation	Motor Freight-Revenue Accounting Car Tracing and Accounting
Utilities	Customer Accounting

Programming aids

There are IBM programming aids for the 1410 that represent large savings in both programming time and expense. Among these are Basic Autocoder, Tape Sort, Input/Output Control System, FORTRAN, Tape Merge, RAMAC-Sort, Tape-RAMAC-Sort, Report Program Generators, Full Autocoder and Utility Programs. COBOL will also be available with the 1410 programming systems. ■

Circle No. 31 on Reader Service Card.

Magnacard System . . .

(continued from page 16)

one standard access arm and one additional arm optional. On a 1410 up to five Ramfiles are available with two additional arms for each file *(total of three arms per file with a limit of 12 arms per system)*. Also available with each system is a new 1407 inquiry station.

The average seek time for the Model 1 is 500 milliseconds; for the Model 2, 600 milliseconds. This average seek time is no better than the time on the original rams for 650 and 305. In this respect the 1405 Ramac is rather disappointing. This column had hoped to see real improvement in the average seek time, especially since this time has been one of the slow aspects of disk storage.

Telex disk files

Evidently the problem of quicker access to data in storage on disks has been better solved by the Data Systems Division of Telex, Inc. Telex has announced the Telex I and Telex II disk file storages. The former has a capacity of approximately 25 million characters, the latter about 100 million characters.

Importantly, access time in the Telex models is 150 milliseconds, significantly less than that of the 1405 Ramac. The difference appears to be because Telex provides each disk with its own pair of read-write heads for servicing the upper and lower surfaces of each disk. Obviously, with each disk having its own read-write head, no time is required to move arms from one disk to another. Hence the reduction in access time. *(Incidentally, Telex is the disk storage to be used on the G.E. 225.)*

Of course, despite the continuance of the one-half second access time, the 1405 is a welcome addition to the growing family of devices which add so much to the power and versatility of the 1401 and 1410 data processing systems. ■

meet the editorial staff

(continued from page 3)

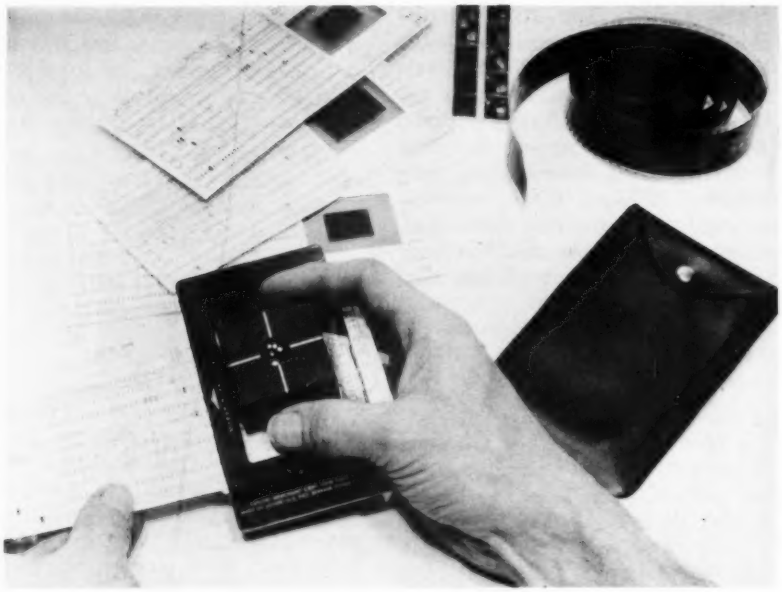
Consulting Editor—Jordon Greene was formerly consultant and data processing representative for IBM, chief engineer with the Gudeman Company (electronics) and R & D engineer with the Detroit Arsenal. He received his BSE-ME and BSE-EE degrees from the University of Michigan. Jordon is well known as a data processing and management consultant and is president of Computer Data Processing Company.

New York Editor — Mr. Murphy is a noted author, lecturer and management consultant with more than eighteen years of practical experience in automatic office methods, working with electronic and integrated data processing systems, punched card and allied methods and procedures. At New York University and Rutgers University Mr. Murphy inaugurated and taught courses in punched card systems and office automation. He is one of the founders of the National Machine Accountants Association. Mr. Murphy is co-author of *The Office in Transition*, published by Harper & Brothers. He is president of E. F. Murphy Associates, New York Management Consultants.

Contributing Editors — Ray Marien heads one of the largest forms programs in the country for the Olin Mathieson Chemical Corporation. Joseph DeParis is manager of systems and data processing research for The F. & M. Schaefer Brewing Company and is past president of the New York Chapter of the National Machine Accountants Association. Raymond Dreyfack is Director of Tabulating Systems for Faberge Perfumes in Ridgefield, New Jersey and is well known as an authority on personnel.

These are some of the people who regularly serve you in bringing the best available information on data processing methods and management through the pages of this magazine. Their objective is to make data processing a more useful tool in the operation of your organization. ■

PRODUCTS & SERVICES



MICROFILM VIEWER

A pocket viewer for microfilm has been announced by the Taylor-Merchant Corporation. It is made of laminated card stock with a unique built-in focus device that allows the entire unit to fold flat (¼") and slip into its own plastic wallet that will fit into a shirt pocket.

The reader is designed to allow vertical and horizontal scanning while holding the subject microfilm secure and steady. This is accomplished by the lens housing moving along hidden tracks in a longitudal motion that allows for complete vertical scanning. Horizontal scanning is accomplished by moving the subject microfilm in a lateral plane through a slot in the viewer, allowing total scanning.

The idea for this viewer came from the war time practice of designating areas of maps by grid coordinates, that is the determination of any point or area by lateral lines designated by letters and vertical lines designated by numbers. Thus any area could be pinpointed by a letter and a number.

By duplicating a horizontal and vertical scanning of the subject, every possible area can be completely scanned while the subject is held in place. The unit will sell for $2.50.

Circle No. 40 on Reader Service Card.

ALGOL FOR BURROUGHS 220

A new, high-speed algebraic compiler — the first operating ALGOL (*Algo*rithmic *L*anguage) program made available by a computer manufacturer — has been announced by Burroughs Corporation.

Devised for the Burroughs 220 electronic data processing system, the compiler accepts a machine-independent, problem-oriented language — permitting scientists and engineers to transmit their problems to the computer in nearly pure algebraic notation. Thus, the problem-solving abilities of the Burroughs 220 can be economically brought to bear on any algebraically stated problem.

Already in operation at more than a dozen Burroughs 220 installations, the new automatic programming system is designed to drastically cut programming time and problem-solving costs. Engineers and scientists can in a few hours attain sufficient mastery of the rudiments of the new system to allow them to state many problems for computer solution.

Compiling speed

Besides offering high translation speed — an average of 500 machine-language instructions/minute — the Burroughs Algebraic Compiler provides computer language programs which are nearly as efficient as laboriously achieved hand-made programs. This compiling speed is made possible by simplified one-pass internal operation. In addition, a one-load "compile-and-go" feature allows for immediate processing of compiled programs, eliminating excessive card handling.

Semi-automatic segmentation in the Burroughs Algebraic Compiler permits construction of a program in which the main body of the program becomes a master routine, controlling the operation sequence and memory assignment of program segments. Thus, the compiler allows the computer to handle programs which exceed the available amount of storage.

Minimum Burroughs 220 system requirements for the compiler include 5,000 words of magnetic core memory; two magnetic tape units; and a one-input, one-output unit Cardatron subsystem.

Built into the compiler are special diagnostic features, which control scanning of the source program for syntactical errors. These are listed without interrupting the compiling process, permitting maximum detection of errors.

Additional symbolic debugging aids provide for the monitoring of the values of variables during the running of the object (machine-language) program. A symbolic memory dump is also available at object time.

Important features

1. Extensive switching capabilities.
2. Extensive decision-making abilities facilitated by a complete repertoire of logical operations on Boolean variables.
3. Ability to handle an array with an unlimited number of dimensions.
4. Self-sufficient procedures for controlling input-output, magnetic tape files and subroutines.
5. Extensive editing and format control facilities.
6. Up to 50 characters for identifiers.

7. Built-in repetitive controls represented by "until" and "for" statements.
8. Completely free field for source program and data.
9. Alphabetic or numeric statement labels.
10. Unlimited nesting of array indices.
11. Unlimited nesting of iterative loops.

Circle No. 41 on Reader Service Card.

NEW KALVAR SYSTEM

A dramatic break-through in the high-speed recording of electronic data as visible and projectable images was announced at a scientific symposium held in New Orleans by the Kalvar Corporation, which manufactures heat developable photographic products.

The completely unique system can transform data at electronic speed into written or numerical characters on film, and into a "TV image" for giant screen projection, Kalvar scientists said.

An electrostatic tube, the Printapix tube developed by Litton Industries of Beverly Hills, California, converts the electronic data to Kalvar film images at the rate of several feet per second. "With this revolutionary system we can track a rocket's flight and project it as a good TV image in a fraction of a second," a scientist told the group attending the symposium at the Kalvar plant. Elimination of earlier time-lags in filming and projecting data as giant screen images is a definite break-through in high-speed recording required in missile work and many business systems. "With the Kalvar super-speed technique, a missile range safety officer can see immediately the missile's flight path and whether the missile is performing properly or must be destroyed," a Kalvar scientist said in citing one use.

In the field of high-speed recording of electronic data as numbers and words on film, the group attending the symposium was cited several examples. "The Strategic Air Command has tremendous volumes of electronic data recorded in its information center, but time-delay in presenting this data as large-screen images for group decisions in exercises can defeat the value of the data. This is unquestionably the fastest system yet devised to perform this function."

This new development in high-speed recording systems for business and government is feasible because of the unique characteristics of the Kalvar film, according to company technicians. Kalvar is the only photographic film now marketed upon which a "discrete" or localized electric charge can be placed, a basic element of the new system. The patented coating on the plastic-base film is also unique in the photographic field in that the latent image on the exposed film is developed by heat alone in the completely dry process. All chemicals are eliminated by the Kalvar technique used in this high-speed recording system.

Circle No. 42 on Reader Service Card.

ROTARY FILES FOR BANK RECORDS

A new rotary file unit, 7 feet in diameter, that can put more than 125,000 record cards within easy reach—and with room for expansion, has just been announced by Acme Visible Records, Inc., Crozet, Va.

Its five step-back tiers hold all cards in view for immediate access by several girls at the same time. The tiers rotate smoothly in three independently moving sections. Since the cards travel to the operator, the unit speeds finding and filing, eliminates personnel movements, and reduces employee fatigue. Its labor saving features enlarge the work capacity of each individual.

Each rotary unit is engineered to fit the volume of records and limitations of space of the individual bank. A typical installation places some 250,000 cards in two rotaries with accessory work tables in a floor space 7 feet by 18 feet. The efficiency of the design shown in the photo made it possible to reduce personnel from 6 to 4.

Principal banking uses of these rotaries are for the rapidly expanding consumer credit records, central file, and Trust Department folders.

Circle No. 43 on Reader Service Card.

NEW COMPUTER RENTAL

In a major departure from the conventional rental systems now in effect in the data processing industry, the Radio Corporation of America announced a new leasing plan better suited to the individual requirements of users of RCA electronic data processing equipment.

The plan provides new economies in costs of operation for customers of RCA systems through four different rental agreements which are tailored for individual data processing needs. It will apply to the new RCA 301 and 601 systems going into use in 1961, as well as the RCA 501, the first completely transistorized, medium-scale data processing system.

RCA's new rental plans represent an important change from the arbitrary standard rental-plus-overtime charging system prevalent throughout the electronic data processing industry.

The four rental plans are designated as unlimited availability, extended availability, random use, and single shift availability. They are defined as follows:

Unlimited availability: Operation of the equipment seven days a week, other than time needed for maintenance, is provided by this plan which affords substantial savings for customers operating the system in excess of two personnel shifts a day. There is a basic monthly charge of 30 per cent over the single shift rental.

Extended availability: This provides up to 24 hours a day, five days a week, other than time needed for maintenance, for a charge of 20 per cent over the single shift rental. It also can be used the other two days

for a prorated charge on the same basis. This plan provides savings for the customer operating more than 1¾ shifts per day.

Random use: This entitles the customer to a maximum of 200 hours, at his option, in each calendar month at a basic charge of three per cent over the single shift rental.

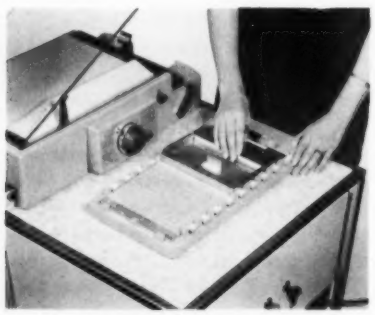
Single shift availability: This is the standard rental for RCA systems, covering a primary shift of eight consecutive hours per day, five consecutive days a week, designated at the customer's option.

Current customers now operating on conventional agreements may remain on such agreements if they desire

Circle No. 44 on Reader Service Card.

PUNCHED CARD USE FOR VERIFAX COPIERS

New techniques demonstrated in the Eastman Kodak Company Verifax exhibit at the International Systems Show in New York October 10-12 hold the promise of greater usefulness for office copying machines at all levels of office procedures.



The Verifax shingling unit fans out 34 punched cards which contain one line of information at the top or bottom. It will also fan out 17 cards which contain three lines of information.

The card tray of the shingling unit is removed and placed in the copier to expose a matrix from which the necessary "list" copies are produced.

Special accessory units used with the Verifax copier and soon to be available for distribution will make the machine the means of simplifying multiple-item listings, such as parts and price lists, bills of material, production orders, and telephone intercept lists.

Used in the past primarily as a fast and economical means of getting a few miscellaneous copies of business papers, the Verifax copiers have recently proved their versatility for internal requisition purchase order and order entry systems with tremendous savings in time and overhead. An original order document, in these systems procedures, is written in pencil only once and then copied with a Verifax machine for all handling procedures. Machine transcribing is eliminated.

Punched card shingling unit

New to the Verifax family is a punched card shingling unit which will fan out 34 80 column cards for easy copying on a single sheet of paper. Thus it eliminates transcribing of lists by hand or reading them out on tabulating machines.

The Verifax shingling unit, scheduled for delivery early next year, is designed to hold 34 cards which contain only one line of written information at the top or bottom or to hold 17 cards which contain three lines of written information. In either case exposure of the "lists" is made on a Verifax matrix measuring 7⅜ by 11 inches. The unit used is the Verifax Signet Copier, the flat-bed type machine with a lighting fixture above.

Circle No. 45 on Reader Service Card.

UNDERWOOD EQUIPMENT

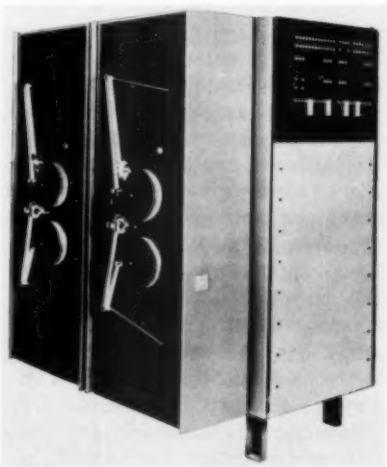
The Underwood Data-Flo line of accounting machines is designed for use at central or widely scattered locations for the preparation of original documents or to perform initial accounting functions while capturing essential data in paper tape for further automatic processing. It has been engineered especially to actuate and control a paper tape punch, and is not, like many other products on the market, simply an adaptation of units designed for other purposes. A variety of numeric and alpha-numeric models are available to meet a

wide range of application requirements. Its outstanding features include a flexible method of mechanical programming that enables positive control of the peripheral operations that it performs. In addition, the tape perforator is an integral part of the machine. Direct mechanical connection between the operating keys, encoding units and the punch assure absolute punching accuracy. Furthermore, a unique principle of punching sequence eliminates all problems normally associated with punched card field size control.

Converters

The Underwood Data-Flo tape to card converter is designed to complement the accounting machine by providing a means of producing punched cards from the paper tape created on the peripheral units. Cable connected and fully synchronized with a summary punch, the converter produces 80 column cards at rates ranging from 6000 to 7200 per hour depending upon the type of punch employed.

All operations are under full program control. A magnetic core in-



ternal memory eliminates the normal requirement for paper tape and punched card data to be in identical sequence. The paper tape is read photoelectrically at the rate of 800 characters per second and checked before card punching. Furthermore, each card is verified automatically after punching. Thus complete accuracy is assured.

The Underwood Data-Flo tape to magnetic tape converter is designed to satisfy the conversion needs of those organizations employing magnetic tape instead of punched cards. Cable connected to a tape drive unit, it records data on magnetic tape at the maximum speed of the Data-Flo tape reader—800 characters per second. Various models are available to meet the differing requirements of the several makes of computers currently on the market. Safeguards have been inbuilt to assure absolute accuracy. Paper tape is read twice and checked. Data is edited and directed to a magnetic core memory where it is checked for parity before read out. After recording, the magnetic tape data is further verified by a read back operation which includes character count for comparison with the memory contents and the use of both horizontal and vertical parity checks.

These products are the forerunners of other Underwood data processing machines scheduled to reach this market in the near future.

Circle No. 46 on Reader Service Card.

MAILING MACHINE

Saul Z. Winter (left), controller of Roos/Atkins, San Francisco retailers, and Lawrence Sheperd, Bell & Howell Phillipsburg representative, check the operation of the new Phillipsburg automated punched card billing machine installed by the 19-store retail operation. The new inserter is the first to handle all types of punched cards automatically. It selects the cards from the rack, assembles them with up to eight additional enclosures, inserts the assembled material in the envelope, seals it, adds correct postage and counts and stacks the envelopes for mailing. Winter said the machine has cut the labor needed to mail 125,000 monthly statements by about 65 per cent.

Circle No. 47 on Reader Service Card.

DACOM

Recordak Corporation, subsidiary of Eastman Kodak Company, has announced a new system combining the advantages of electronics and microfilm. DACOM (DAtascope Computer Output Microfilmer) matches the speed of the computer.

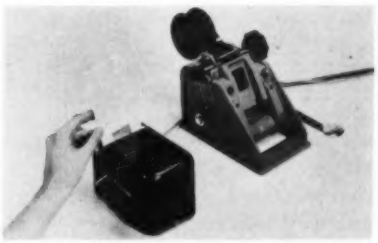
The new system takes the bits of information from the magnetic tape, or directly from the computer, and translates them into letters or figures instantly. These appear as a finished message on the face of a cathode ray tube. With DACOM, as many as 66 lines of 130 characters can appear as a page. This can be photographed on microfilm at a speed of over two frames a second or over 15,000 characters a second. The use of the microfilm medium permits mountains of information in compact form to be used or stored, viewed or reproduced in print.

Circle No. 48 on Reader Service Card.

MICROFILM VIDEO TRANSMISSION SYSTEM

In the electronics field, Nord Photocopy & Electronics Corporation unveiled, at the National Business Show, its Microfilm Video Transmission System, which permits a viewer miles from a central transmission point to instantaneously view microfilm material on a high-resolution television screen. The viewer at the remote control unit can scan the microfilm, select a portion he wishes to look at in detail and then enlarge it up to 60 times microfilm aperture size.

Circle No. 49 on Reader Service Card.



DATAFLOW MICROFILM MOUNTER

A new unit, designed to speed the precision mounting of microfilm on aperture cards in automating engineering drawing reproduction systems has been developed by Dataflow, Inc.

Designed for use in conjunction with a mounter, the new device instantly and clearly removes the glassine protective covering from the adhesive edge of the aperture, eliminating bending or crimping of the card stock, and avoiding damage to the adhesive. Since the stripping operation is completely mechanical, there is no opportunity for moisture from hands to weaken bonding properties of the adhesive edge.

With this unit, the aperture card is simply dropped into the slot in the unit, window side first. The glassine is removed the instant the operator touches the operating lever. The card is then removed, ready to receive the microfilm image.

Information from the field indicates that with the new unit, inexperienced operators show a 100% increase in the production of mounted cards . . . experienced operators increase mounting speed in excess of 20%. ■

Circle No. 50 on Reader Service Card.

DATA . . . yours for the asking

For your convenience in obtaining pertinent and helpful information on the latest equipment, forms, services and related products in the data processing field, we direct your attention to the following free literature available from the manufacturers. Circle the numbers pertaining to the literature you wish to receive on the Reader Service Card appearing elsewhere in "DP."

COMPUTER SERVICE for piping flexibility analysis, recently announced by The Service Bureau Corporation, a subsidiary of IBM, is now described in a 12-page booklet. Using a simplified do-it-yourself input feature, the service provides an analysis within 24 hours, or less. The computer program took more than two and one-half years to develop and perfect. A step-by-step report on the analysis of a three-anchor system and two two-anchor systems is outlined in the booklet.

Circle No. 70 on Reader Service Card.

"ALL PANELS Are Not the Same" is a MAC Panel pamphlet designed to assist management in achieving the most effective and economical data processing operation possible through a better understanding of one of the tools of the trade — control panels. Questions that should be kept uppermost in the minds of those responsible for the purchase and use of control panels for EAM and IBM data processing equipment are answered in a thorough discussion of control panels.

Circle No. 71 on Reader Service Card.

MICR PRINTING is the subject of the "Question and Answer Book about Magnetic Ink Printing," published on behalf of the banking industry by Moore Business Forms, Inc. It offers a simplified approach to magnetic ink printing on checks and other forms to answer the many questions that have been raised about this new bank forms processing method.

Circle No. 72 on Reader Service Card.

"FRIDEN IDP PRODUCTS in Action" is a 28-page booklet covering over a dozen major data processing systems which are controlled automatically by Friden business machines. Step-by-step illustrations and concise explanations are included of such diversified applications as letter writing, purchasing, manufacturing control, and bank check coding. The booklet serves as a handy reference guide.

Most of Friden's tape-operated machines are presented: Flexowriter for document writing, Computyper for invoicing, Teledata for code transmission, Collectadata for collecting work data, and Selectadata auxiliary unit for data selection-readout.

The building-block concept is also indicated, whereby various auxiliary input-output units may be connected to a Flexowriter to provide varying degrees of automation as the system demands. Auxiliary units for this purpose include tape, edge card, and punched card readers; tape and edge card punches; punched card punch control; and Selectadata readers. How all of these hookups are integrated with allied equipment and their functions is illustrated as well.

Circle No. 73 on Reader Service Card.

CONVERTERS brochure features a problem solved for a leading stock brokerage firm, Merrill Lynch, Pierce, Fenner & Smith. The solution is in the form of a Digitronics converter which, in the words of the stock broker, will pay for itself in less than two years, based on the economies achieved. The brochure presents the problem, solution, and results, in complete detail. It describes the need for equipment to convert from magnetic tape directly to five-hole tape, for teletype transmission, how Digitronics designed and produced a converter to fit into Merrill Lynch operations, and the savings in time, space, personnel, and rentals.

Circle No. 74 on Reader Service Card.

■ ■ ■

Notable Quotes

"Just as college students now may take music appreciation courses, without knowing how to write or play music, in the future they should be able to elect computer appreciation courses which would concern the ideas behind the applications of the machine rather than using the computer itself." *Professor R. W. Hamming,* in a speech at the University of Michigan.

"Companies report big costs are involved when they have to train graduates for executive jobs. Some estimates go as high as $20,000. Many others say it costs $5,000 to $10,000. And it takes a long time. This money would produce better results if used on pre-work education. If business wants special skills taught in colleges they will get them quickly when they finance part of the cost. Money spent for endowments, special scholarships, and educational research will pay big dividends." *Charles A. Hill,* Modern Office Procedures, October, 1960.

"Why, in this age of advanced management techniques and application of scientific procedures, do business men shy from the use of standards or even the term itself?

"Perhaps the business man's concept of a standard should be that of the flexible goal — the best performance possible at any given time. This concept avoids rigidity—avoids the temptation to fit everyone and everything into a mold.

"Standards are useful; they are in fact indispensable, management tools." *Editorial,* Office Executive, September, 1960.

"Self confidence is a realistic feeling that you can fulfill the demands of a productive and successful career. It is rooted in a feeling of adequacy that allows you to take a strong hand in your own development. In this sense the self-confident executive is self-directed.

"The individual who believes in himself generally believes in others. He who doubts himself, doubts the whole world." *Eugene F. Jennings, "How to Build Self-Confidence,"* Nation's Business, July, 1960. ■

RAY MARIEN

–A Monthly Feature **Marien on FORMS**

Don't Forget the Other Ninety Percent!

ONE OF THE GRAVEST ERRORS a forms analyst can make is to overlook the simple, flat forms in his company and concentrate on the more elaborate, so-called *specialty* forms.

Yet, this often happens, and the biggest companies are just as susceptible to this oversight as the smallest ones. The reason is easy to understand. The fancier a form is in its construction, the more *expensive* it is to buy. But — it is not always the most expensive to *process*. And here is where the trouble lies.

It is not difficult for us to recognize that a 10-part snapout, with stripped or die cut carbons, copy changes on each part and perhaps even containing a built-in offset master is a costly form. When we go to buy it the price staggers some of us, especially those who have little conception of the work involved in printing such a form. The price is justifiable, of course, but it is high. That is why some forms analysts concentrate on the specialty type of form, either continuous or snapout, that adds the most dollars to their outside printing bill, to the exclusion of all others. They forget that they are covering *only* 10% of their companies' forms and the other 90% vanish into limbo! Requisitions for those are processed mechanically, without an attempt to redesign them, or change the specifications.

"Too busy now to bother with that small stuff!" is a typical brush-off in such instances. Well, it's not *small stuff* if it takes in 9,000 forms out of 10,000 in a company! *Someone* is using those forms. *Somebody* is struggling over them trying to make sense out of them. And those *someones* and *somebodys* make up the vast majority of your work force.

Proper design

A machine can't think, therefore if you design a form properly for it, it fills it in prettily and pounces on the next one, as fast as its printing head revolves and its ratchet feed can satisfy its appetite. But what happens if the design is off? Does the machine stop to ponder this strange deficiency? Heck, no! It goes right on, pounding out its printed statistics merrily, without fretting over the resultant mess.

A human being obviously cannot act *completely* like a machine no matter how well he adapts himself to his job. He has to *understand* the form to fill it in sensibly. Also, the poorer the design, the longer it takes him to decipher it and determine just *where* the data should be written.

As long as most of our forms are filled in by *people*, the least the forms analyst can do is to make allowance for it and give them forms that *simplify* their clerical duties, instead of adding to their troubles!

Yet, to go back to our original point, this simple fact is overlooked too often. I realize that specialty forms require more care and precision in design than the common, flat variety. But no forms department should ever flatly disregard the others. In many cases, the forms that are being filled in by hand *today*, will be part of a data processing system *tomorrow*. Often, the bright light of an idea may flash on the analyst when he spends a little time studying an inexpensive flat form. Sometimes, an entire systems change may result from such a simple beginning. How can the *thinking* systems analyst afford to miss such an opportunity?

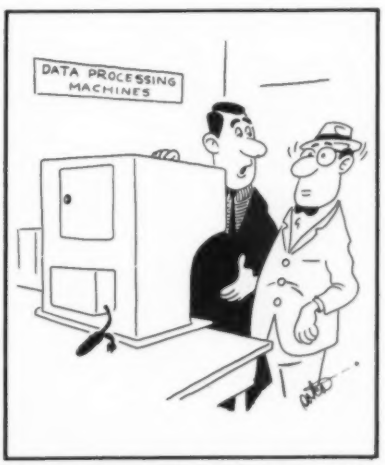
Include all forms

There are other reasons for making a determined effort to include *all* forms in your program. First, control is not really control if you worry about only 10% of your forms. Second, the appearance of your *cheapest* forms reflects on your company and its *corporate image* just as much as the expensive ones do. To your employees, the ones who have to *toil* over some of those monstrosities, the picture of the company for which they work is one of an organization that doesn't concern itself too much with their working tools.

I recently listened to a systems *specialist* make this remark—"We don't fuss with small savings. Nickel and dime stuff isn't worth bothering about!"

He sounded like someone who wouldn't eat anything less than caviar. The bread and butter routine was not for him.

Well, I felt like this: I will gladly take every five dollar saving a forms analyst can turn up. Because he'll produce them *again* and *again*—and the first thing you know, he's saving *more* for his company than the caviar man. He's making the bread and butter, day-to-day dollar savings on which a successful program is built. Believe me, they *do* add up and they should never be scoffed at or ignored. In most companies, they represent the bulk of the dollar savings made through forms control.■



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5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: (This information is required by the act of June 11, 1960, to be included in all requests regardless of frequency of issue.) 6413

(Signature of editor, publisher, business manager, or owner)

Sworn to and subscribed before me this 14th day of Oct. 19 60

(SEAL)

P. C. SUTTER, JR.
Notary Public, Wayne County, Michigan
My Commission Expires Mar. 12, 1963

POD Form 3526 — (July 1960)

BOOK SHELF

PROCEEDINGS OF THE NATIONAL MICROFILM ASSOCIATION NINTH ANNUAL MEETING, edited by Vernon D. Tate, National Microfilm Association, P. O. Box 386, Annapolis, Md., 250 pages.

This is a collection of papers presented during three days of panel discussions by representatives of industry, government and libraries.

Industry members introduce and give specifications and functions of improved products developed to contribute to work simplification and record recall. Also presented are discussions of miniaturization developments and systems. Much of the equipment is already available or will be by early 1961.

Included are reprints of panel discussions by eight Department of Defense representatives who told how microfilm works for national security, how microfilm is speeding the development and production of new weapons by compressing the time and space for engineering data.

Other sections:

Microfilm — Secret Agent is a description of the part microfilm played in the war.

Municipal Arteriosclerosis — and Hardening of the Records — Dr. Morris M. Cohn, Editorial Director, New York Water Works Engineering and Wastes Engineering, advocates the use of microfilm for water and sewer records instead of bulky full-scale drawings of systems, to be carried in emergency trucks.

A discussion of microfilm activities in the government of Nassau County in connection with tax records, estates administration, hospital records, and recording of deeds.

Connecticut Medical Services, Inc. of New Haven, Connecticut, uses a microtape system to solve storage and high reference frequency problems.

Librarians discuss the development of microfilm, special needs, and how to set up a photoduplication department.

The meetings of NMA offer an annual opportunity for members of industry, government and other special fields to exchange technology and experience in order to meet the challenge of modern day needs for reduction, dissemination, retrieval and reproduction of records, drawings, and documents. ■

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editorial

BUSINESSES DO NOT SEIZE OPPORTUNITIES OR MAKE MISTAKES. People do. In concerns of all sizes, and in spite of the conversion to data processing operations, it is the people more than any other single factor, who are the keys to success or failure. In small concerns each executive, at all levels of management, is usually more important, proportionately speaking, than is an executive in a large corporation. This is true because the small business executive generally has a broader influence on the course of his firm as a whole than the big company man can exert on his enterprise. Moreover, the small business executive often does several different and important jobs at the same time.

Finding the right man for the right job today is a problem all executives live with, whether they are in a large or small company. Industry is still short of well trained men, men at the level of junior and middle management. Men who are trained in data processing techniques with experience in the proper application of these systems to their overall business.

Relatively few executives have learned to take advantage of the great potential inherent in the data processing system. The strain of maintaining the existing business operations in a company undergoing transition to a data processing system is becoming increasingly more severe to the mature executive. It would be well for companies contemplating a data processing system to immediately augment their executive staff with young executives capable of working under heavy strain for long arduous hours during the months of transition.

Whereas yesterday's business man was required to have the guts to cling to a conviction, the ability to make correct decisions and the knowledge of a supply and demand economy, his successor — you — must meet those requirements *plus* the tests posed by the problems of a world growing constantly more tense and its people more testy under the existence of two political ideologies at war.

So now, more than ever, what management does with its people is vital to the company's life. Bursting on this scene with the force of an exploding bomb, data processing systems and automation in the office have accelerated to a tremendous degree the problem faced by the modern business executive. Driving home this fact, Charles Bell, president of General Mills, is reported to have commented, "Competition nowadays is not one company's product against another's but one management against another."

The management that is backed up by an efficiently operating data processing system can certainly be considered in the driver's seat when it is opposed by a management relying on hit or miss planning, seat-of-the-pants scheduling, and fingers crossed forecasting. Where competing companies both have data processing systems, it becomes a battle not of the best system but rather how the system is best applied, so again we come full circle around to the original statement that businesses do not seize opportunities or make mistakes. People do. ■

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